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Burnett

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(45) **Date of Patent: Nov. 12, 2002**

(54) **IMPACT TOOL**

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PCT Pub. Date: **Nov. 5, 1998**

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(52) **U.S. Cl.** **81/22**; 81/20; 81/26
(58) **Field of Search** 81/20, 21, 22, 81/25, 26

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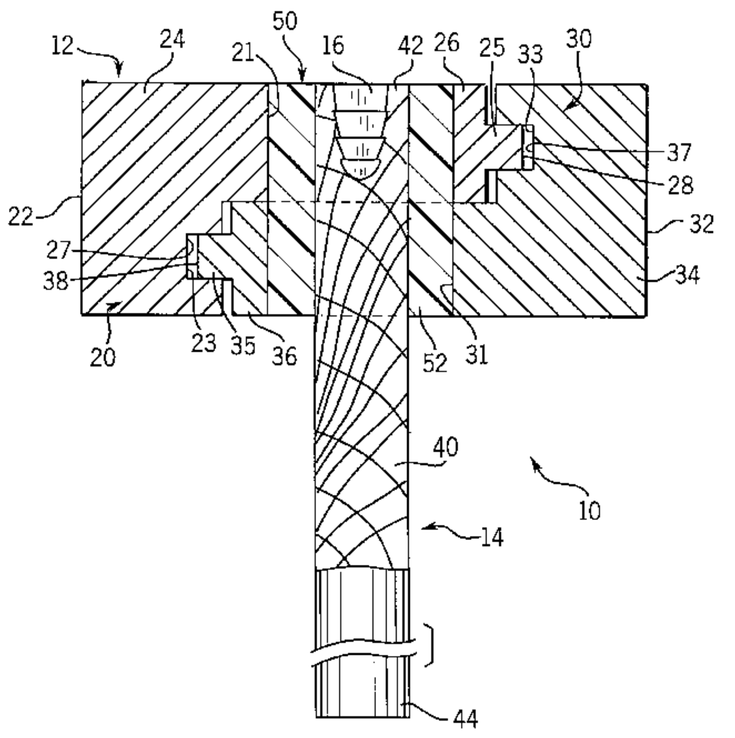
(57) **ABSTRACT**

An impact tool having a head structure including first head piece, a second head piece and an elongated handle structure. With a lengthwise section of the handle structure being arranged in operative association with and maintaining the first and second head piece of the head structure in operative combination relative to each other. A woven fiber material is arranged about and epoxied to the lengthwise section of the handle structure arranged in operative association with the first and second heads to enhance the interface therebetween.

25 Claims, 10 Drawing Sheets



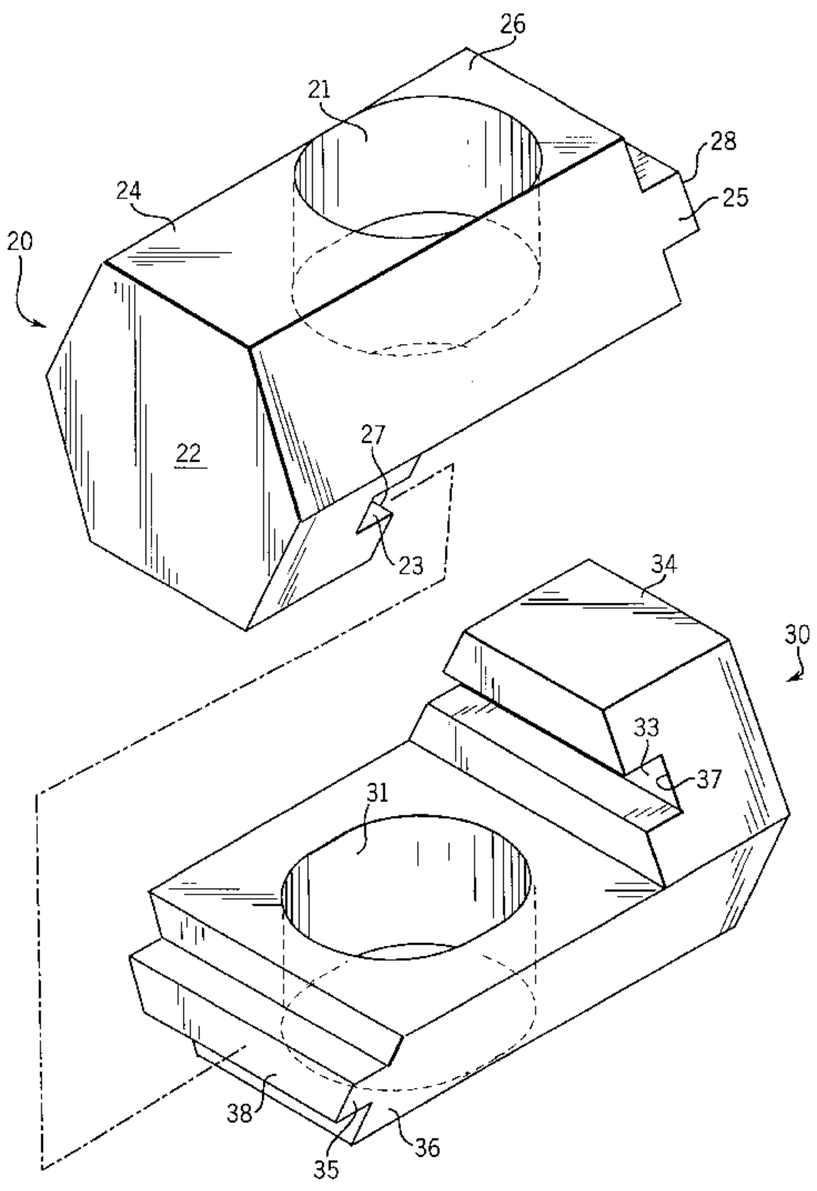


FIG. 1

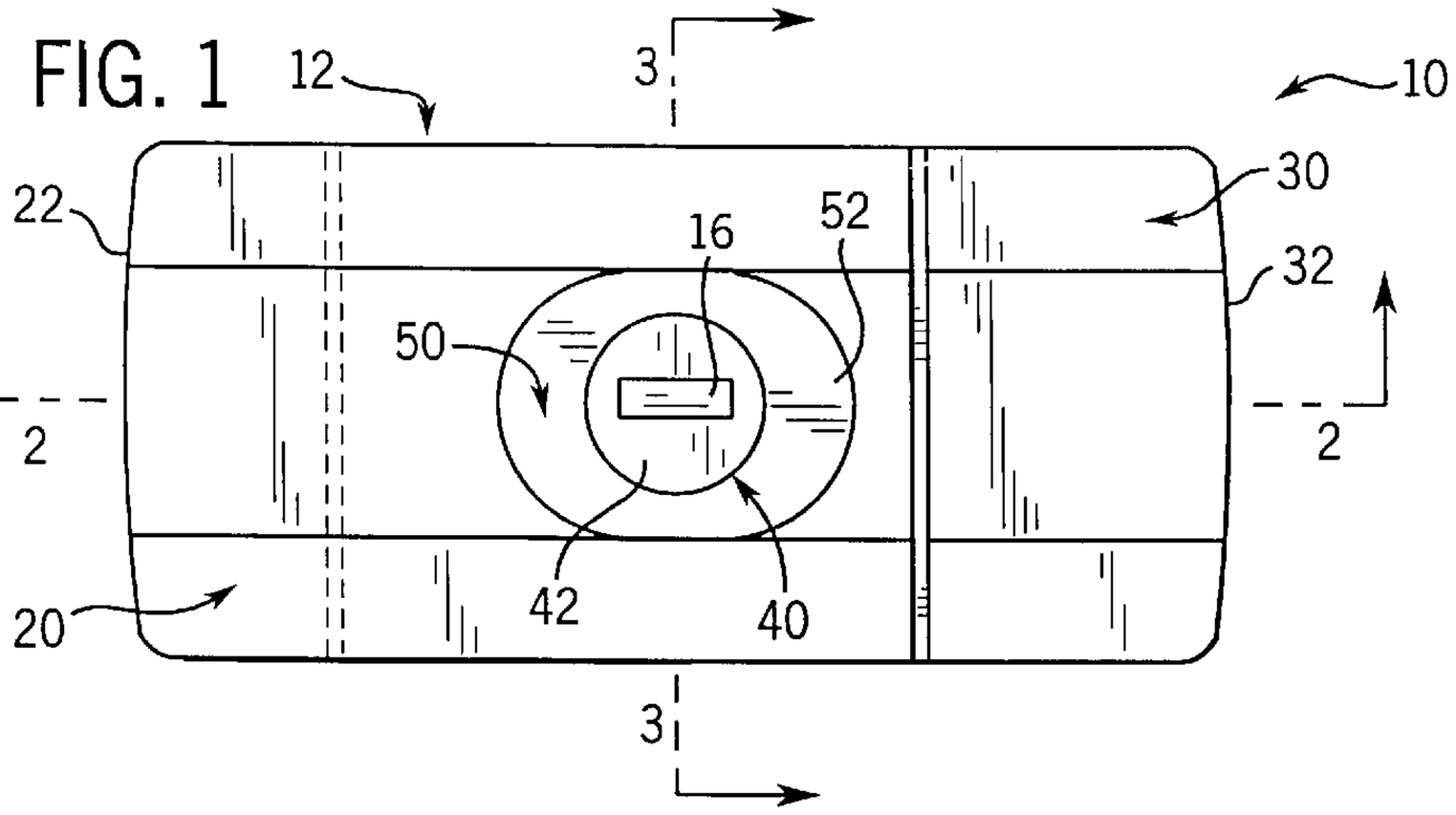
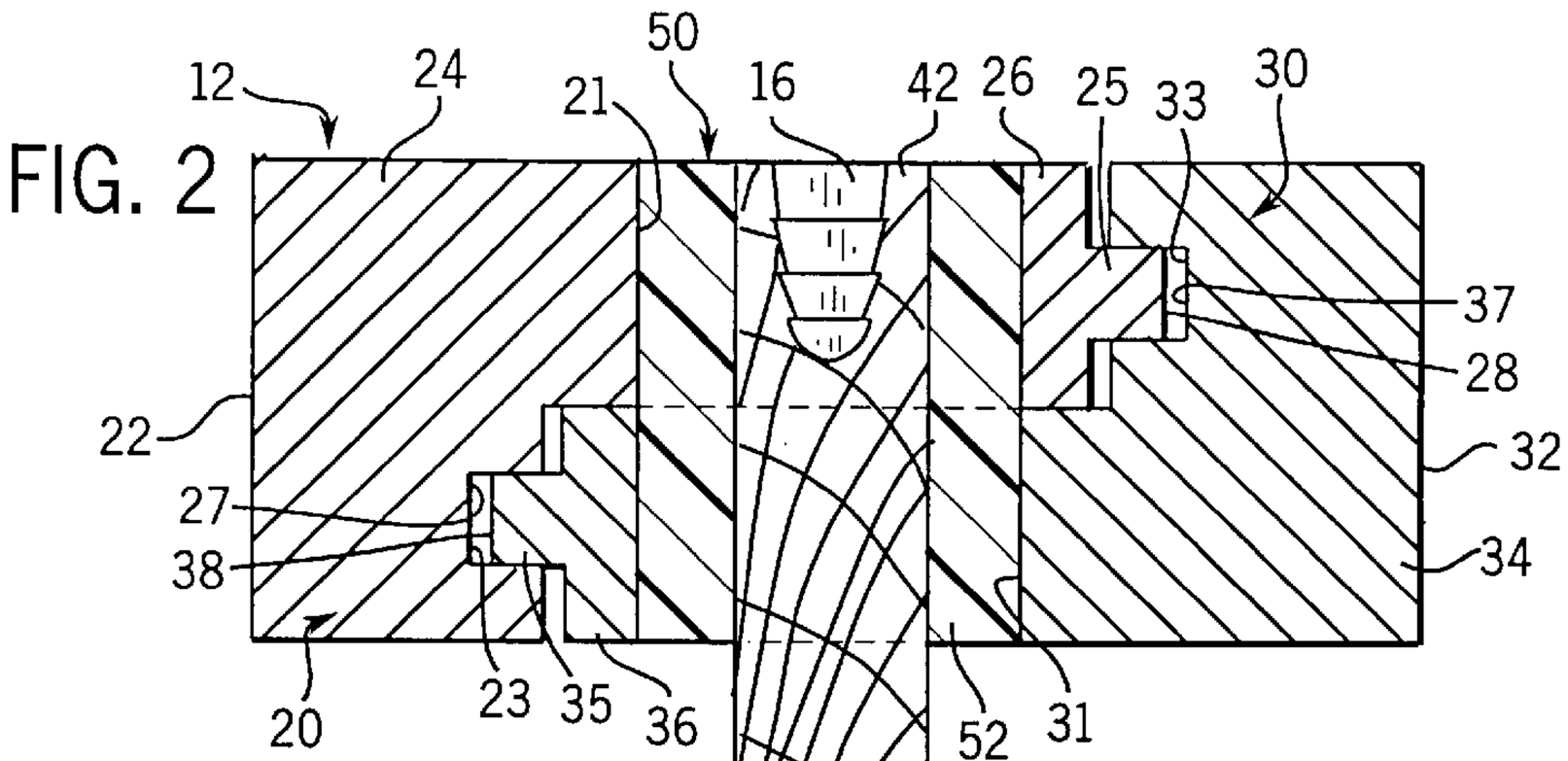


FIG. 2



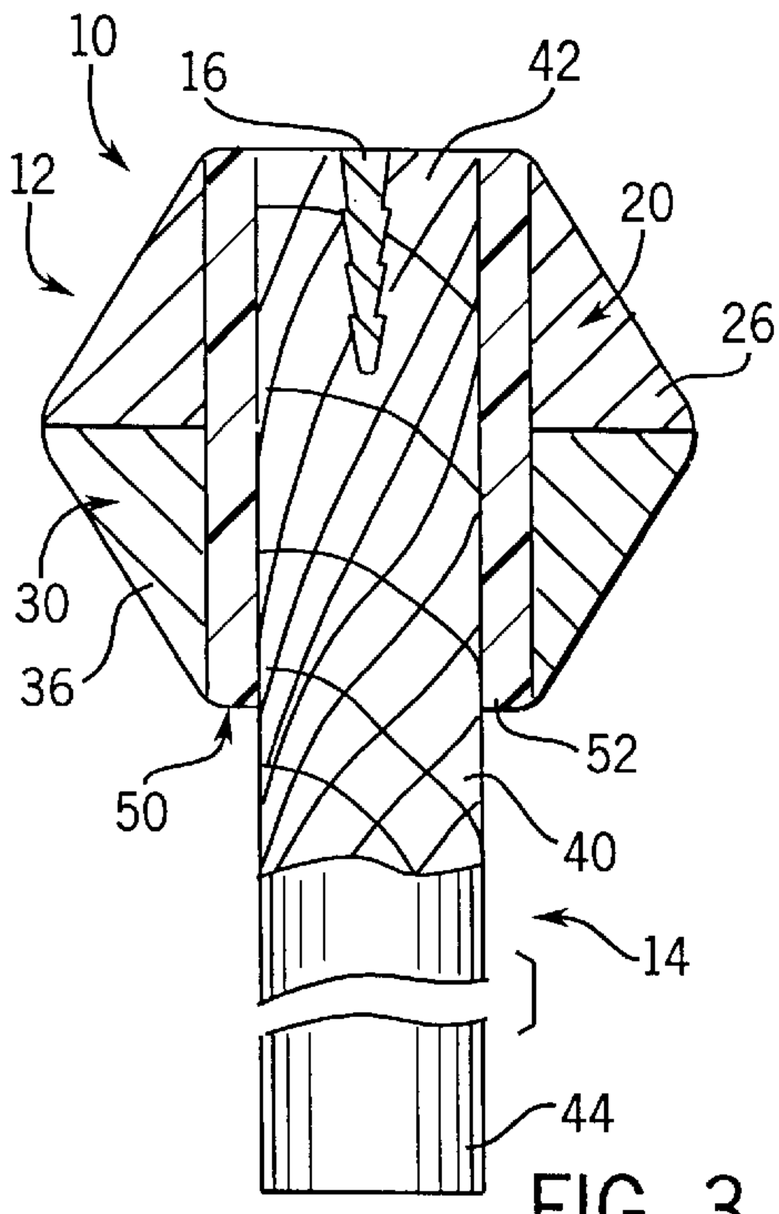


FIG. 3

FIG. 4

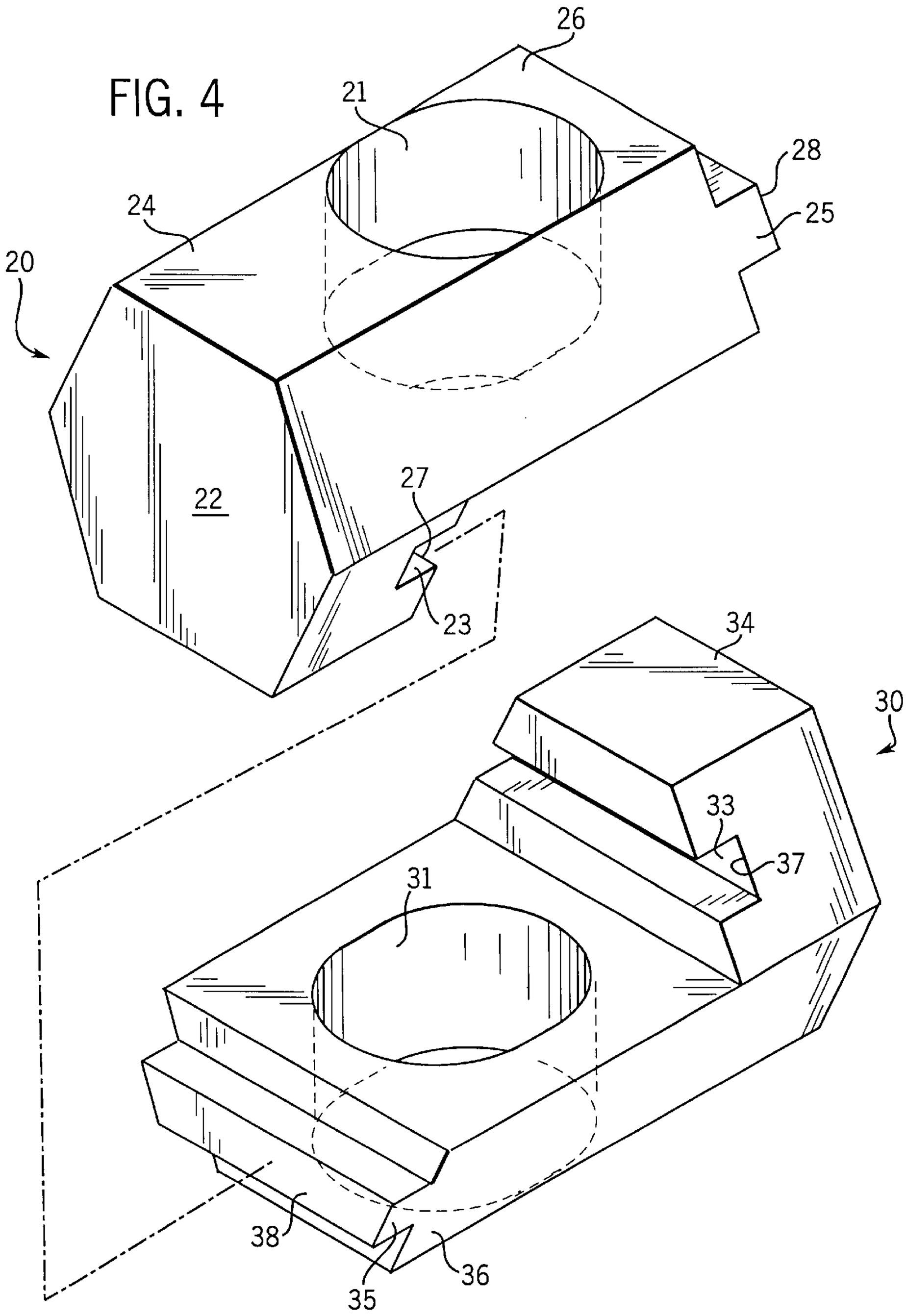


FIG. 5

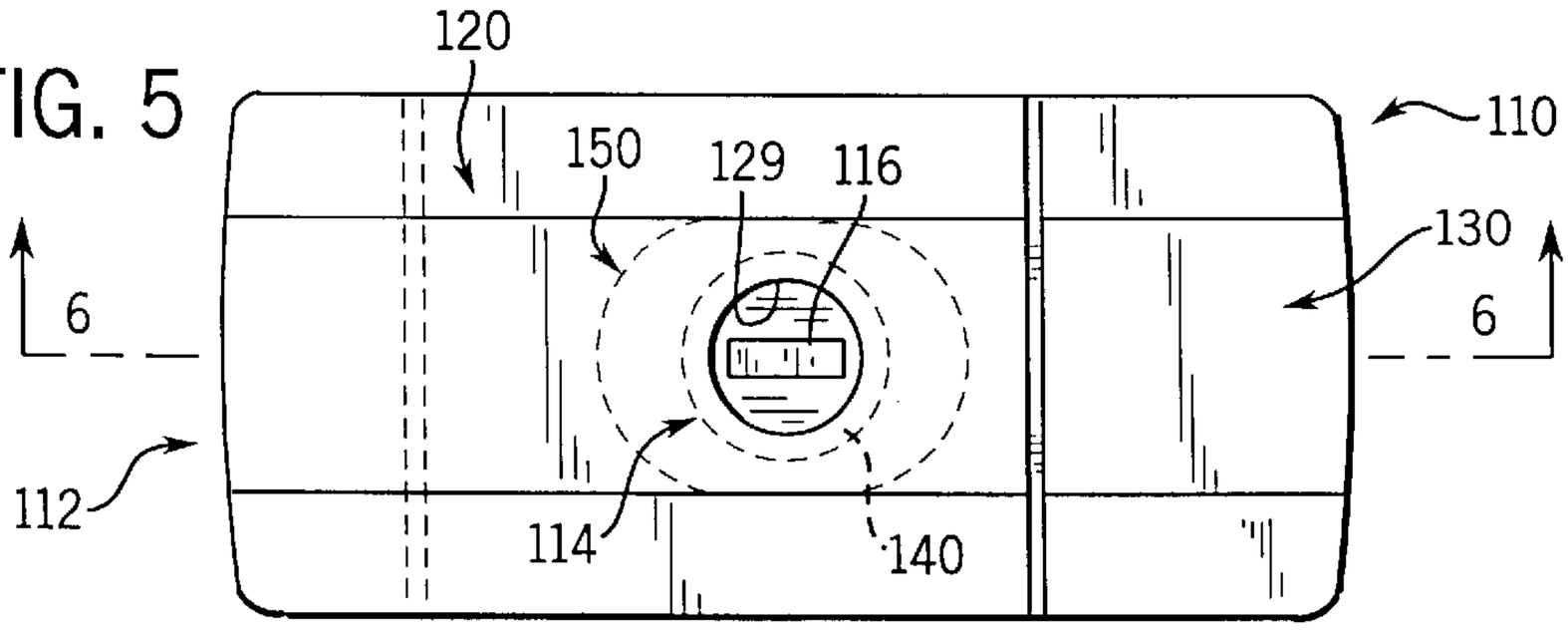


FIG. 6

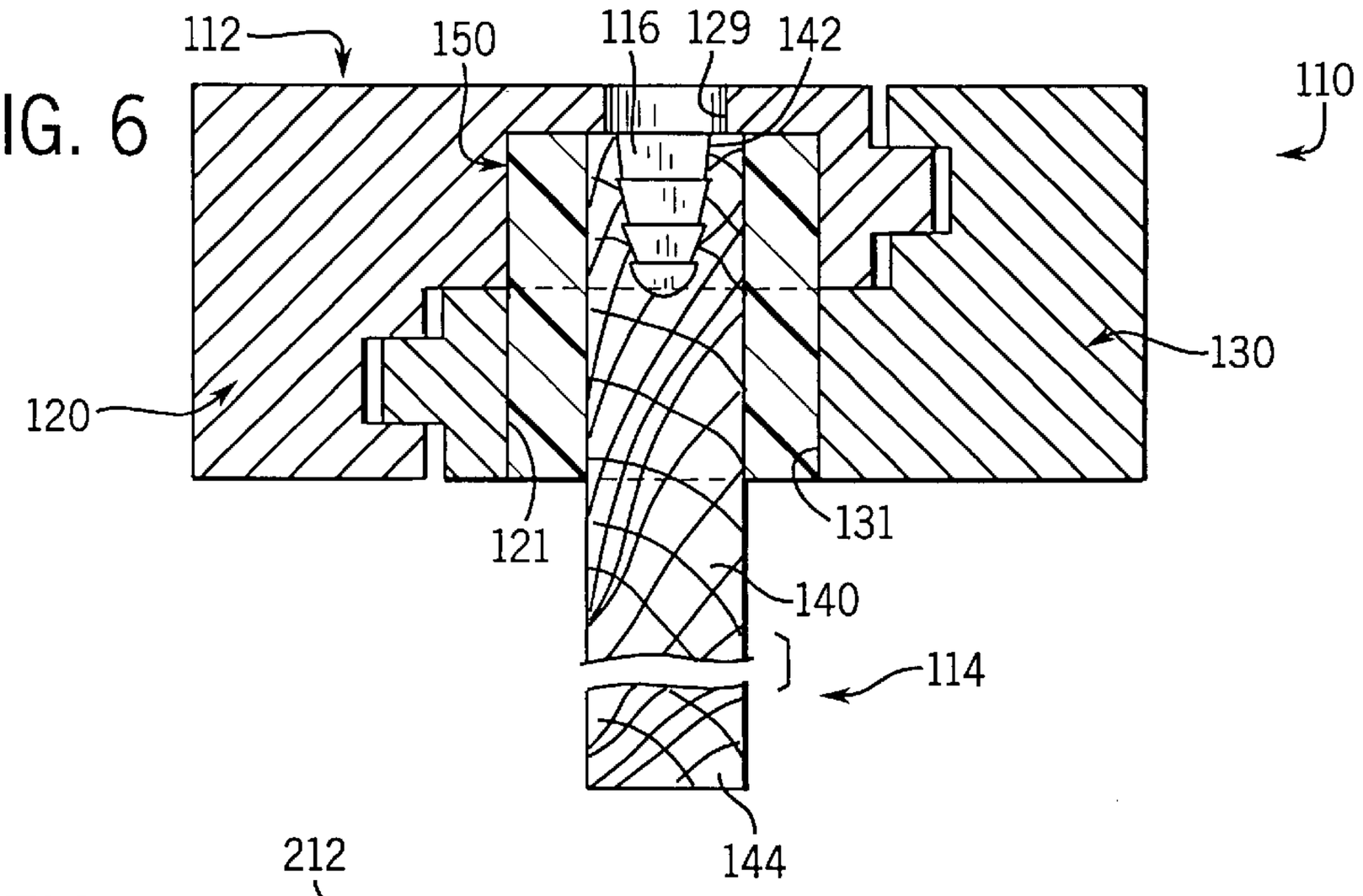
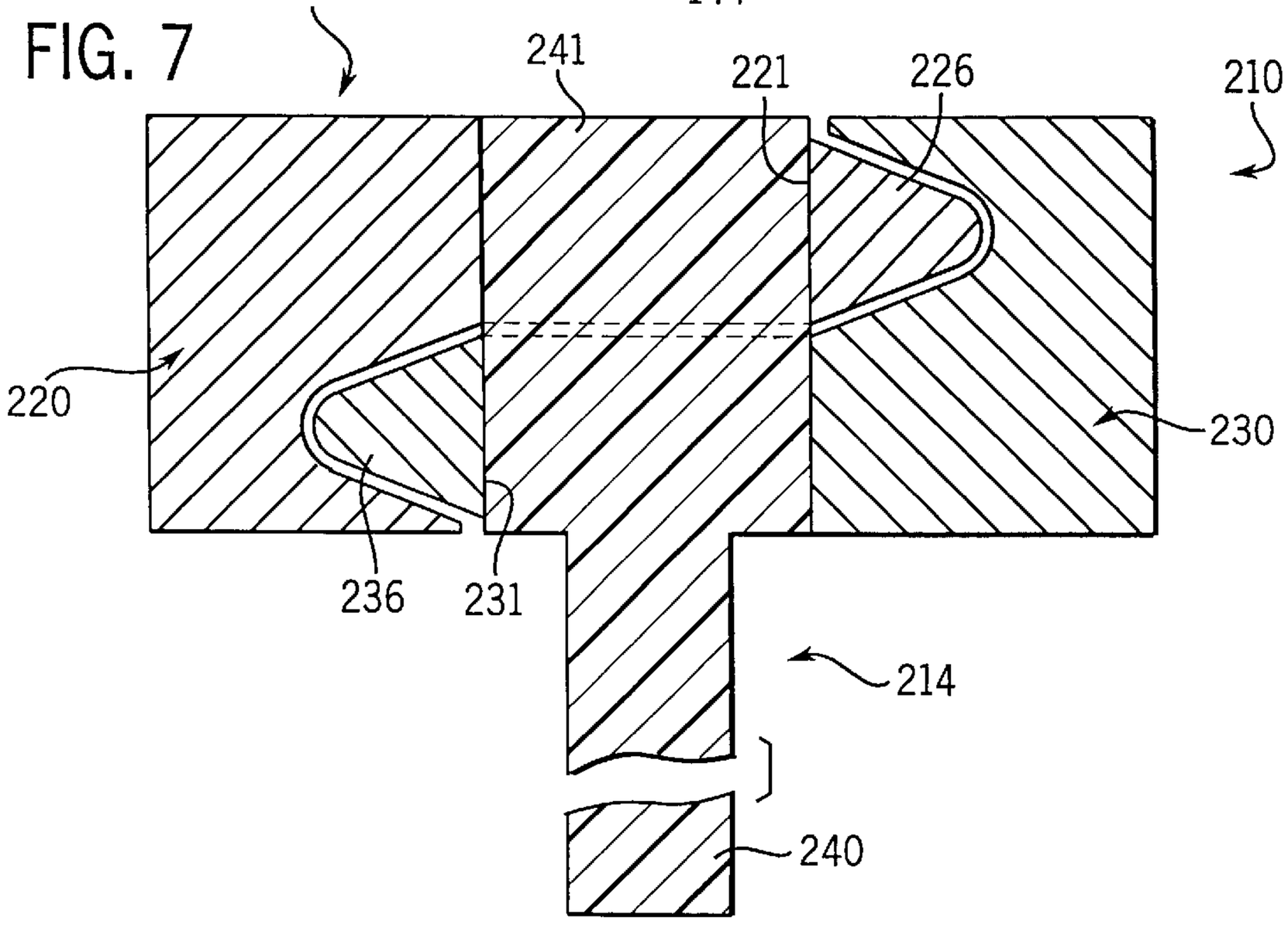


FIG. 7



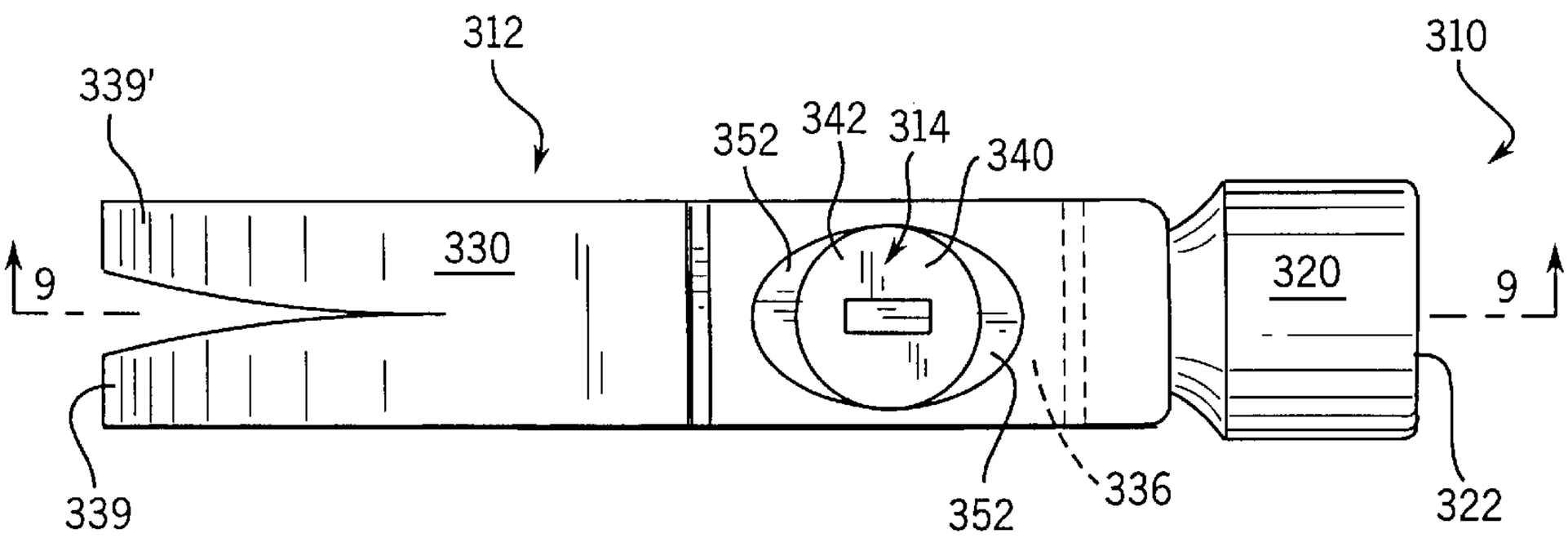

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FIG. 8

342
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FIG. 9

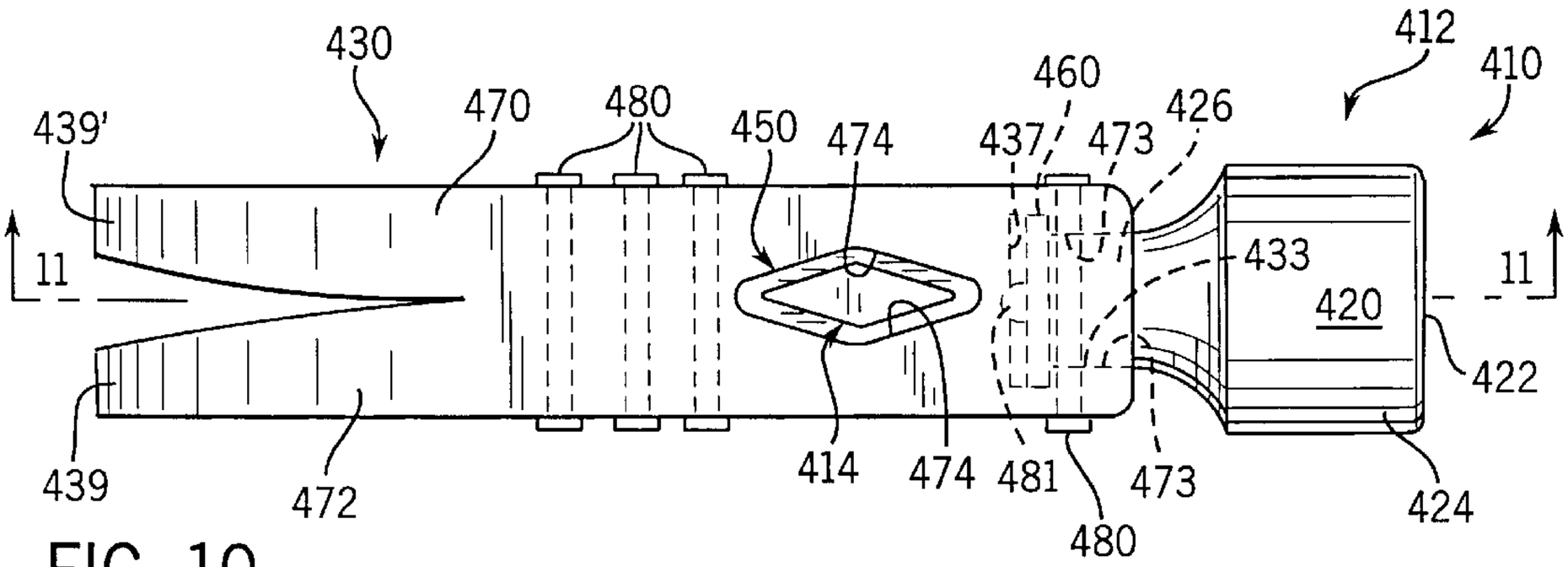
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FIG. 10

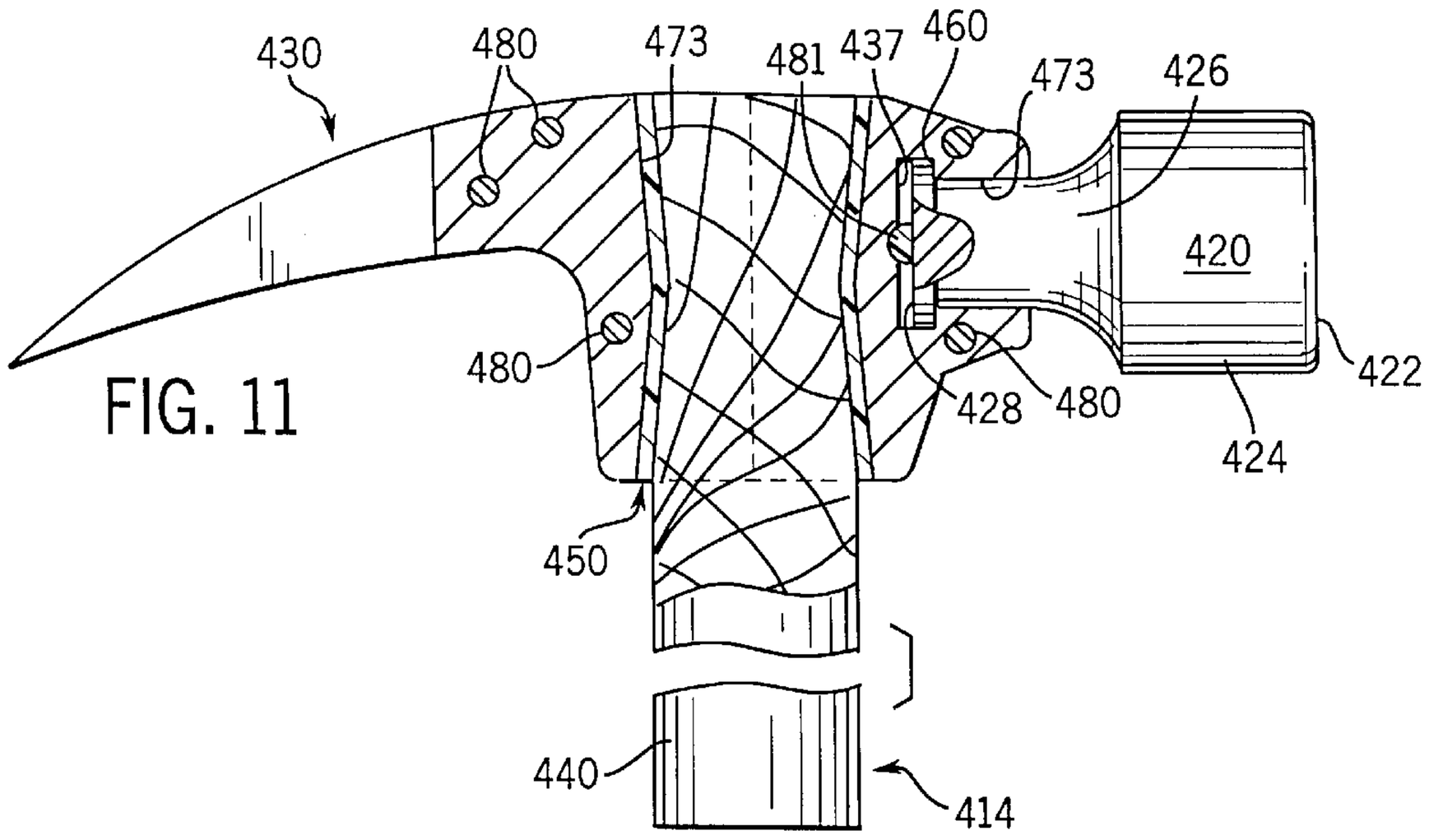
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FIG. 11

FIG. 12

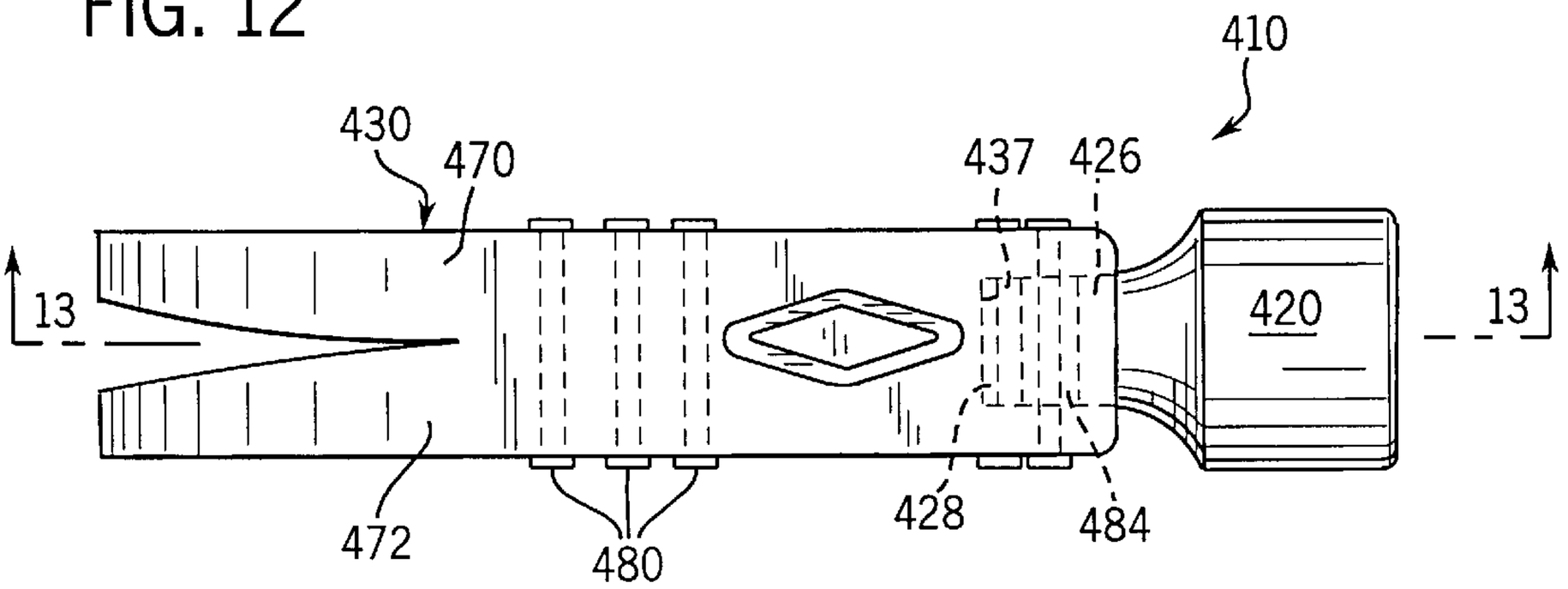
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FIG. 13

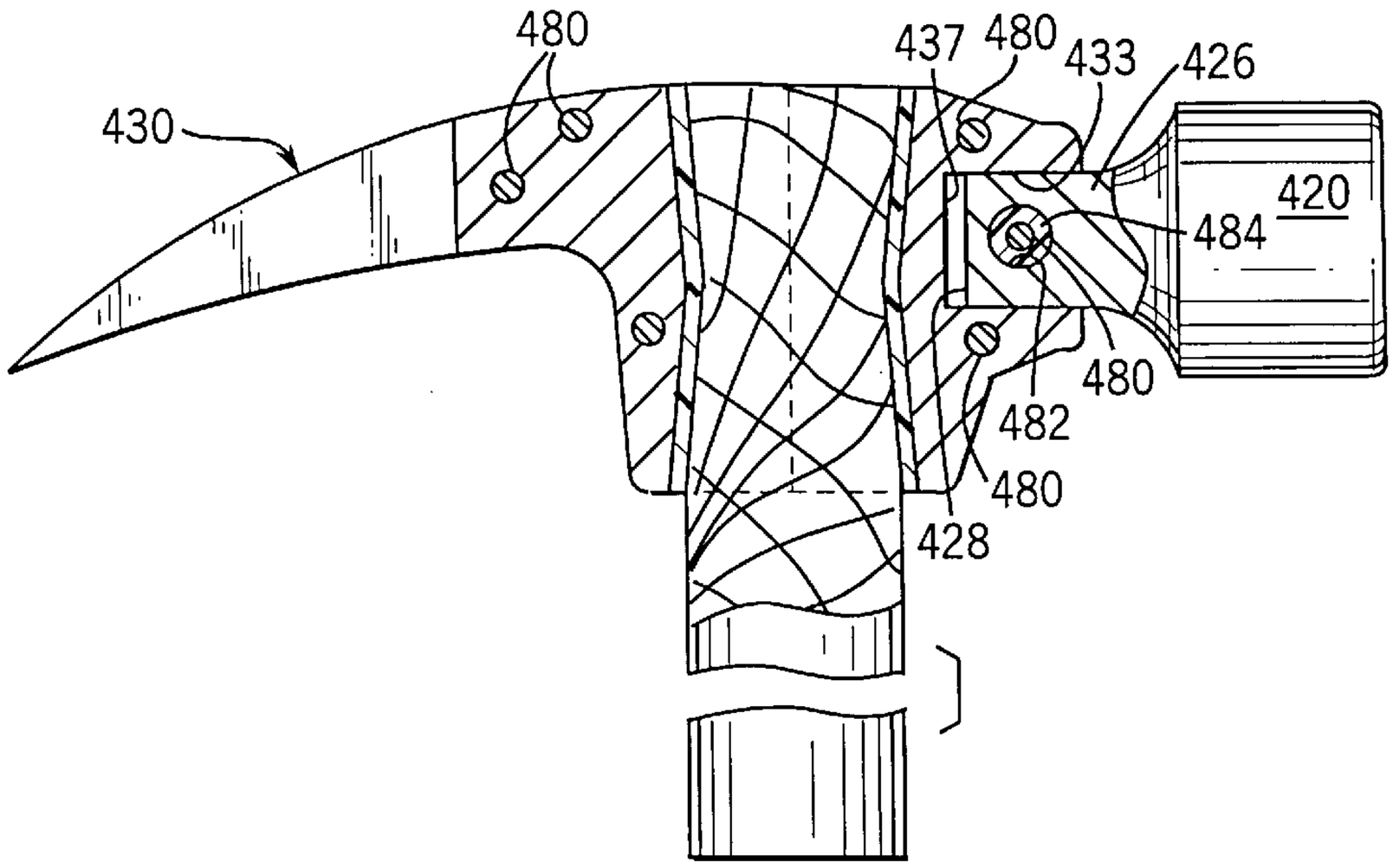
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FIG. 14

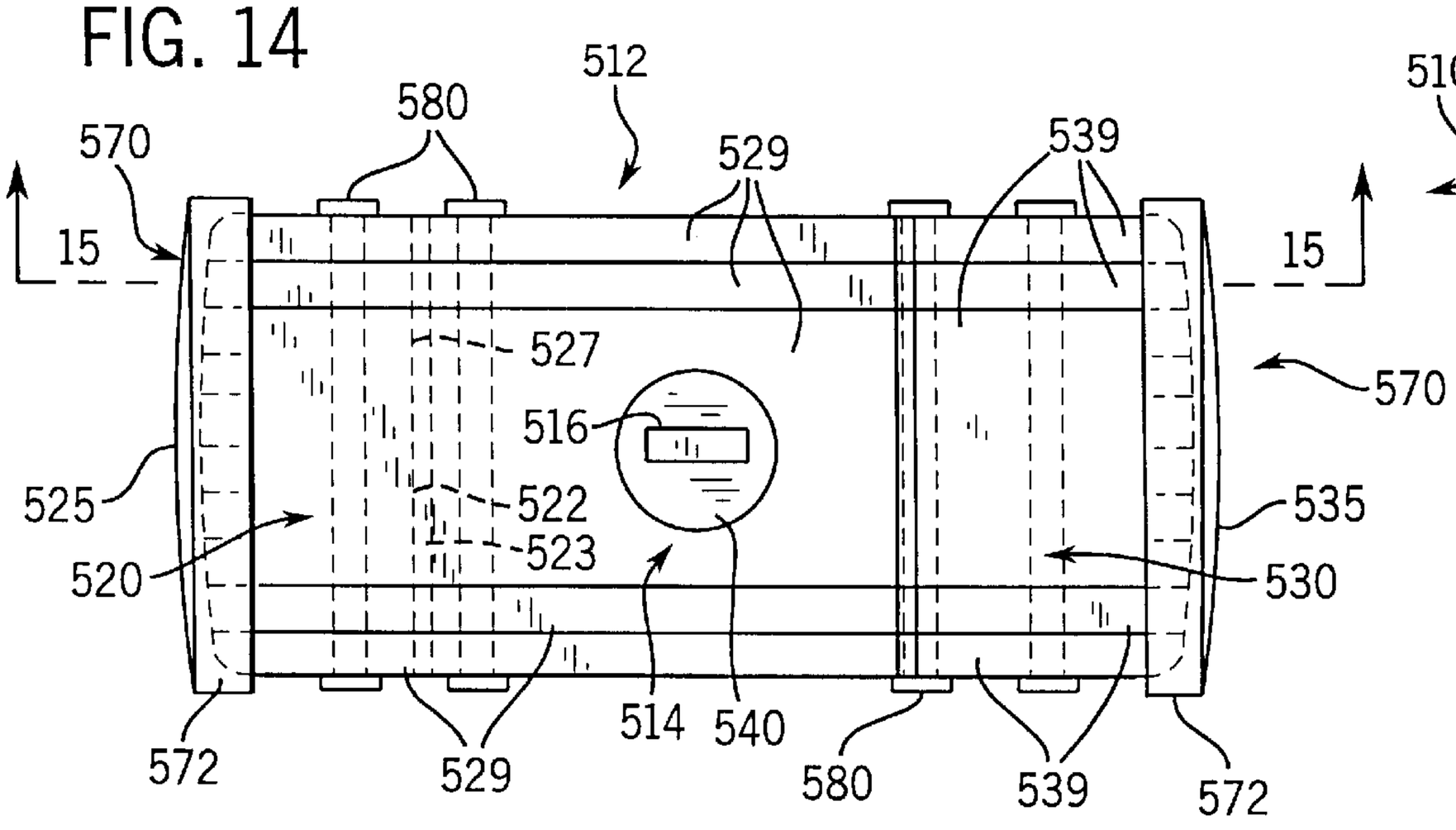
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FIG. 15

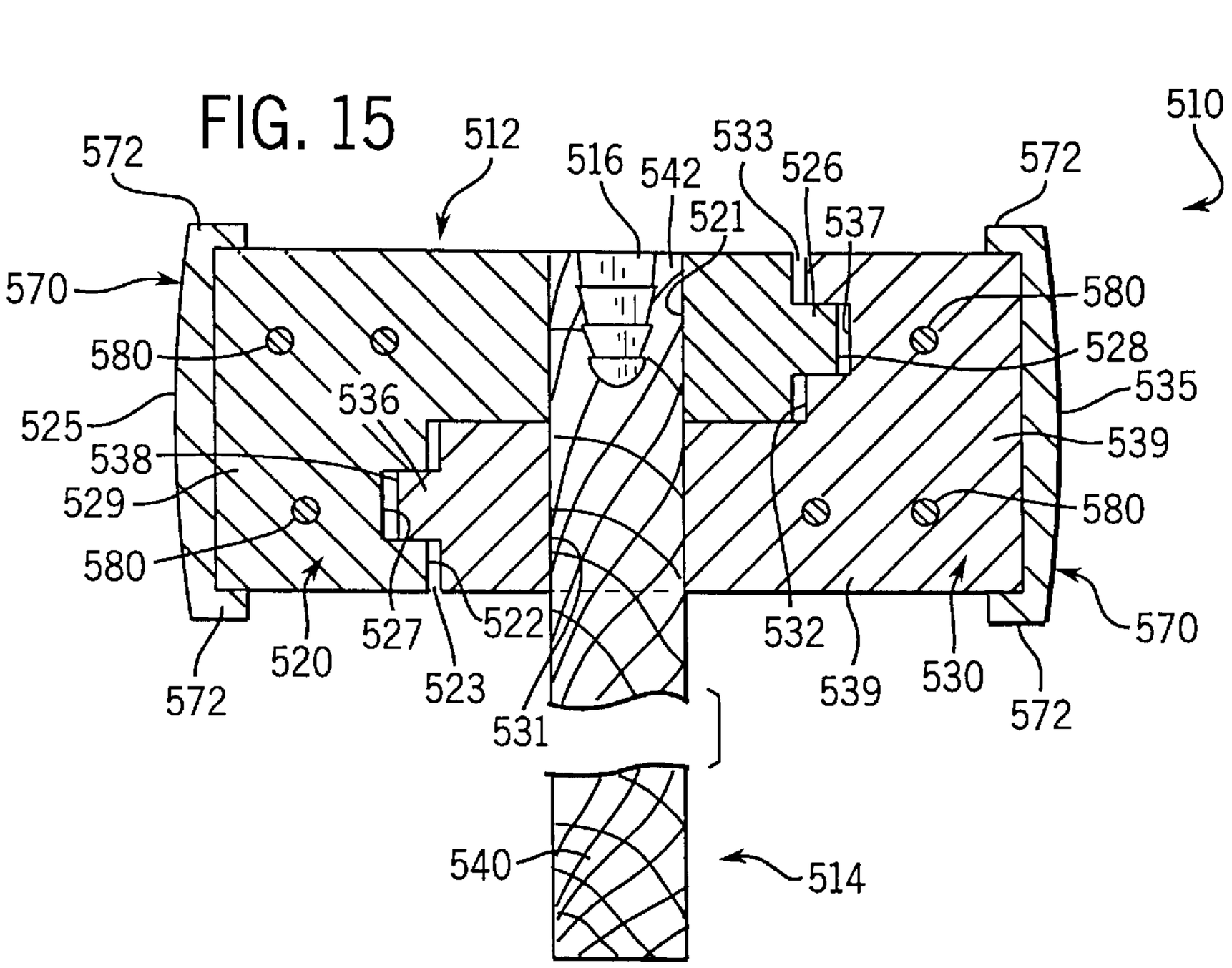
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FIG. 16

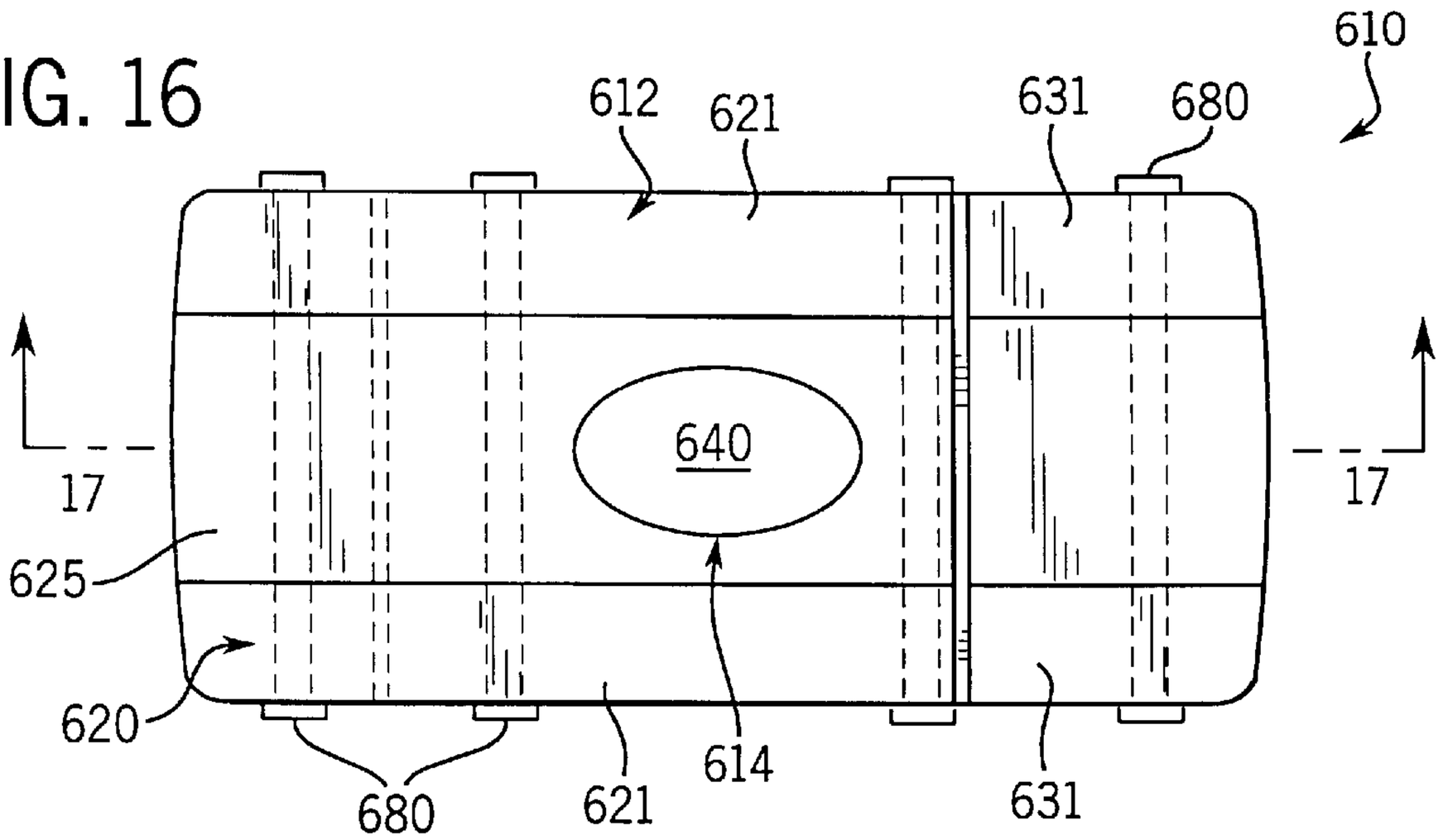
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FIG. 17

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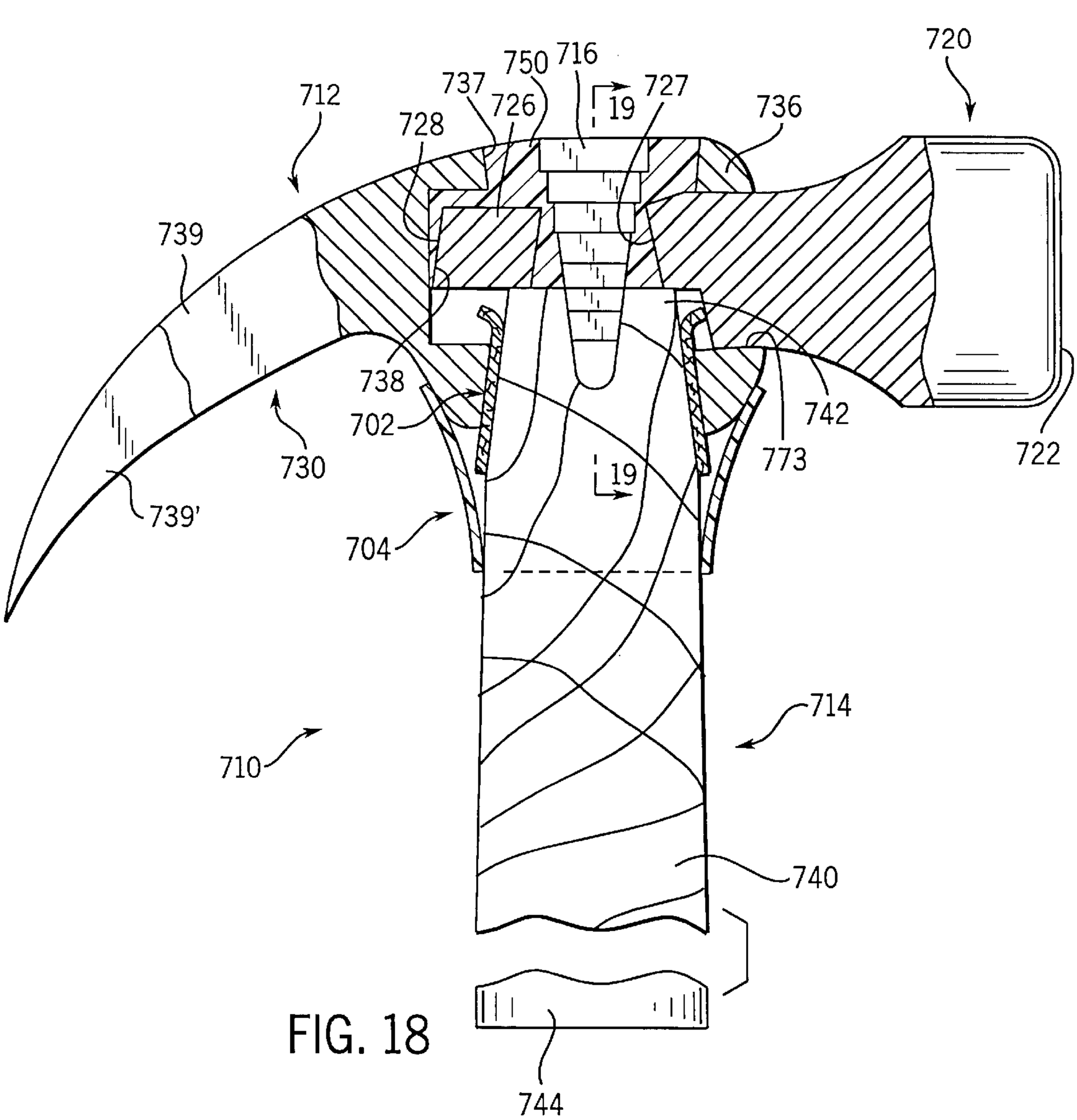
712
728
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722
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739'
704
710
714
740
744

FIG. 18

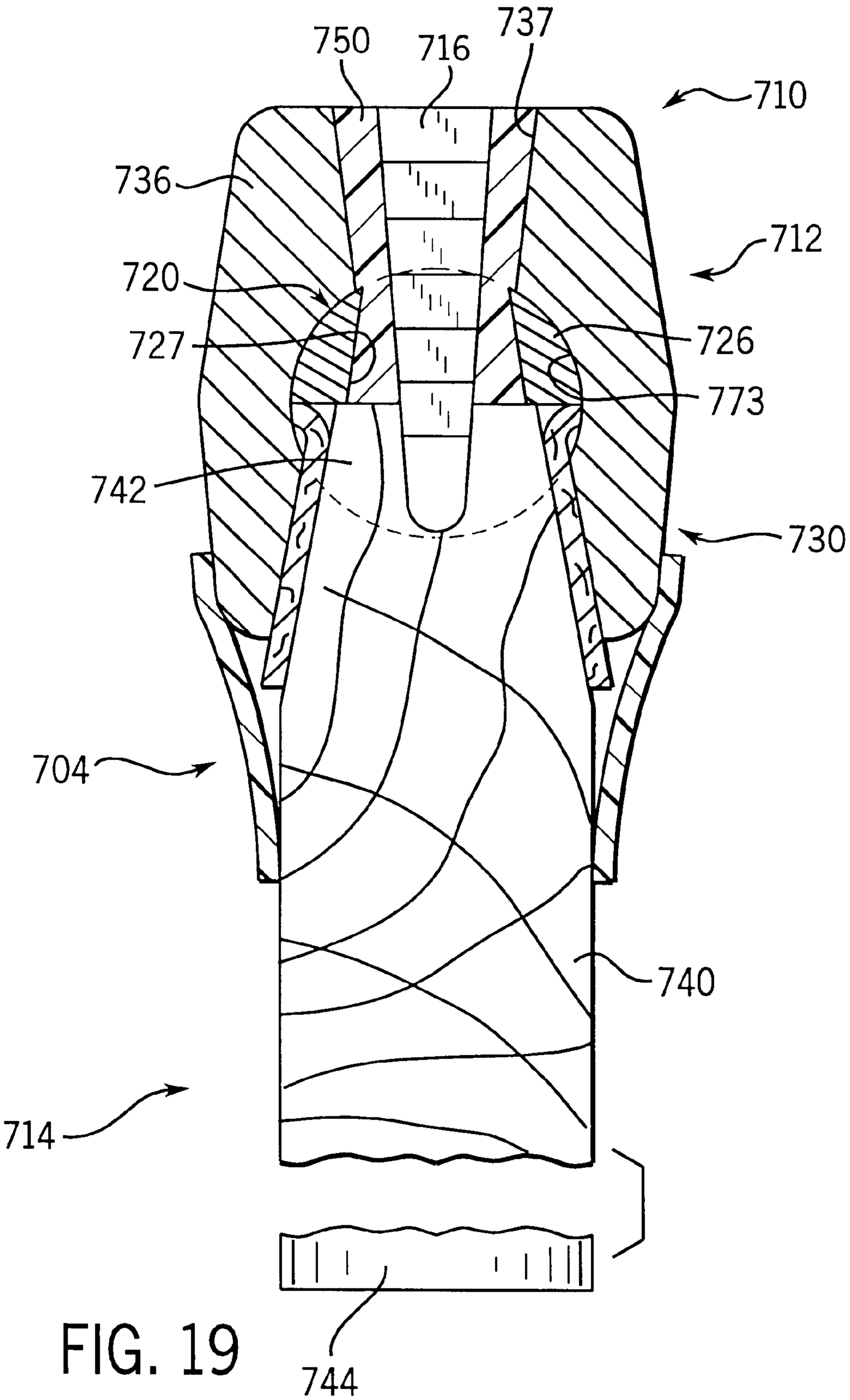

FIG. 19

IMPACT TOOL

FIELD OF THE INVENTION

The present invention relates to hand held manually operated tools and, more particularly, to impacts tools such as hammers and the like having a head structure including two separated members which are joined by an elongated handle structure.

BACKGROUND OF THE INVENTION

Impact tools such as hammers, axes, picks and other hand held manually operated striking tools are well known and have been used for centuries. Each of these tools come in a variety of shapes and sizes. The specific construction of the impact tool varies widely according to the desired specified use.

Such tools are typically provided with a one-piece head structure formed from steel or the like and usually includes two metallic impact or striking surfaces. Carpentry hammers typically have a metal striking head at one end and a claw configuration at an opposite end. Alternatively, the hammer can include heads formed from a softer material such as lead or hardened rubber material to provide nonmarring impact surfaces.

Hammers typically have included a handle extending away from the head structure to provide the hammer with a generally T-shaped configuration. The one-piece head structure is typically created from a forging operation to add strength to the head structure of the impact tool. Typically, a lengthwise portion of the handle fits through a bore or opening provided in the one-piece head structure. A wedge or other suitable fastening device is driven into the free end of the handle to fasten the handle to the head structure.

When a tool such as a hammer is moved to strike a surface of an object, part of the kinetic energy developed through the hammer's swing is utilized in doing the desired work on the object being struck, another part is dissipated as heat, while another part is converted into potential energy in the form of recoil or rebound of the hammer from the surface being struck. The distortion of the striking surface of the hammer has potential energy much the same way as a compressed spring. It is this potential energy that causes the hammer to recoil or bounce back from the surface of the object being struck. Moreover, hammers usually transmit some force of the impact to the user's hand, which will increase efforts and labor of the user, thus reducing the operating efficiency of the tool.

To reduce this problem, there have been developed hammers offering a "dead-blow" characteristic. For example, attention is directed to my U.S. Pat. No. 5,408,902, offering a composite hammer embodying a split head design wherein a non-load bearing internal head assembly is carried by a rigid outer load bearing framework which provides strength and stiffness to the tool. The "dead-blow" characteristic offered by my patented tool is accomplished through a split head tool design that remarkably reduces and substantially eliminates transference of the impact from the striking head to the user's hand.

While the invention disclosed in my U.S. Pat. No. 5,408,902 offers significantly improved results over other impact tool designs, there is and industry mandates a continuing effort to improve product technology. As a result of those continuing efforts, the present invention has been realized.

SUMMARY OF THE INVENTION

In view of the above, and in accordance with a preferred form of the present invention, there is provided an impact

tool including a head structure with first and second members extending in opposite directions from each other but which are maintained in interconnected relationship relative to each other by a handle structure extending normally from and secured to the head structure.

In one form of the invention, the members of the head structure are formed from metal. In that embodiment wherein the impact tool is configured as a hammer, at least one of the members of the head structure is a striking head which can include an exposed metal striking surface. The other member of the head structure for the hammer can be configured as a claw or, alternatively, a second striking head with an exposed metal striking surface.

In a preferred form of the invention, each member of the head structure includes a working portion and an attachment portion. The attachment portion of each member of the head structure extends, at least partially, in surrounding relation relative to a lengthwise portion of the handle structure so as to prevent the member from becoming disassociated with the handle. Forming the attachment portion of a claw-like configured head with a clevis-like configuration appears beneficial to distribute forces imparted thereto during operation of the tool.

The handle structure includes an elongated handle formed from any of a myriad of materials selected from the class comprising; wood, plastic, metal, nylon, fiberglass, an elastomer, or suitable rigid material. In a preferred form, the handle structure further includes a wedge-like member driven into the free end of the handle. The wedge-like member serves to maintain the handle structure and head structure in secured engagement relative to each other.

In accordance with one aspect of the present invention, and while remaining interconnected through the handle structure, the members of the head structure are separated from each other in an axial direction. The spacing between the members of the head structure allows for movement of the head structure members in response to one of the head structure members being struck against a surface. That is, when one member or head of the head structure is struck against a surface, the spacing between the heads or members of the head structure allows the unstruck head to move toward and impact against the struck head thereby providing a secondary blow that inhibits the tool's struck head from rebounding from the struck surface and thereby dampening vibration through the handle.

In a preferred form of the invention, the attachment portions of the heads or members of the head structure are configured with confronting impact surfaces. The spacing mentioned above is provided between the impact surfaces on the heads or members of the head structure. The range of spacing between the members of the head structure varies and is dependent upon a number of factors. That is, the spacing between the members of the head assembly varies as a function of the mass distribution or geometry of the head structure members, the material from which the head structure members are formed, the timing of the collision between the head structure members, and the length of time the striking surface of the head structure striking member remains in contact with the struck surface. A spacing between the impact surfaces ranging between about 0.010 inches to about 0.070 inches appears appropriate.

To promote movement of the members or heads of the head structure moving toward each other in response to use, the tool of the present invention can further include elastomeric material disposed between the handle of the tool and the heads or members of the head structure. The elastomeric

material has a hardness ranging between about 40 Shore A durometer hardness and about a 95 Shore A durometer hardness. Suffice it to say, the elastomeric material acts as a spring for returning the nonstruck head to a normal or operational position after moving toward and impacting with the struck head or member of the head structure. Accordingly, any suitable material which, during operation of tool, will initially compress and subsequently return the unstruck head to an operational position will suffice.

Another aspect of the present invention relates to configuring at least one of the members of the head structure from laminations. The other member or head of the head structure is captively received between laminations of the other member. After captively arranging the heads or members of the head structure relative to each other, the laminations are fixedly secured to each other. The handle of the tool extends through and is maintained in association with either of the members or heads of the head structure and extends generally perpendicular relative thereto.

With this aspect of the present invention, a striking plate or cap can be arranged in combination with the laminations. The striking plate defines a striking surface for the tool and, thus, inhibits separation of the laminations during use of the tool.

With the present invention, the head structure preferably comprises dual heads or members which are generally axially aligned relative to each other. Because the heads or members of the head assembly of the present invention can be manufactured separately, the manufacturing equipment and processes for forming the heads or members of the head structure are significantly simplified, thus, reducing manufacturing costs and thereby enhancing the selling price of the tool. Configuring one or more of the striking heads with laminations furthermore enhances the manufacturing process.

Arranging elastomeric material between the heads and the handle of the tool furthermore enhances this invention. The elastomeric material effectively isolates the heads from the handle and thereby significantly reduces vibration transfer from the head structure through the handle and to the user's hand.

The concept of splitting the heads of the head structure to allow for axial movement of the heads relative to each other furthermore enhances performance characteristics of the present invention. Thus, when one head or member of the head structure is struck against a surface, the other head or member of the head structure acts as a lagging mass and provides a secondary blow to inhibit the struck head from rebounding from the surface being struck. According, an advantageous "dead-blow" feel is provided to the tool. It has been found that vibrations normally experienced in the handle of the tool are not discernable with the tool designed in accordance with the present invention.

Still another aspect of the present invention involves arranging a skin of resin impregnated fiber material, preferably an arimid fiber material, along and about the lengthwise portion of the handle structure extending into operative association with the head structure of the impact tool. Preferably, an epoxy is used in combination with the fiber material or skin. Moreover, the fiber skin or material plus the epoxy defines a more cumbersome path for impact vibrations to traverse between the striking head of the head structure and the handle structure thereby significantly reducing vibration transference during use of the tool. Additionally, a cosmetic cover is preferably arranged beneath the head structure and extends about the handle of the handle structure to aesthetically cover any free ends of the fiber material extending from the head structure of the tool. As will be appreciated from an understanding of this aspect of the present invention, the presence of an epoxy material about that portion of the handle structure extending into operative combination with the head structure will enhance securement of the head structure and handle structure to each other while advantageously dampening vibrations whether the head structure is of a unitary design or of the two piece design as disclosed above.

These and other objects, aims, and advantages of the present invention will become more readily apparent from the following detailed description of the invention, the appended claims, and the accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. **1** is a top plan view of an impact tool embodying features of the present invention;

FIG. **2** is a sectional view taken along line **2—2** of FIG. **1**;

FIG. **3** is a sectional view taken along line **3—3** of FIG. **1**;

FIG. **4** is an exploded perspective view of the members forming a head structure of the impact tool illustrated in FIG. **1**;

FIG. **5** is a top plan view of the alternative embodiment of the present invention;

FIG. **6** is a sectional view taken along line **6—6** of FIG. **5**;

FIG. **7** is a longitudinal sectional view of another alternative form of the present invention;

FIG. **8** is a top plan view of another alternative embodiment of the invention;

FIG. **9** is a sectional view taken along line **9—9** of FIG. **8**;

FIG. **10** is a top plan view of yet another alternative form of the present invention;

FIG. **11** is a sectional view taken along line **11—11** of FIG. **10**;

FIG. **12** is a top plan view of another alterative form of the present invention;

FIG. **13** is a sectional view taken along line **13—13** of FIG. **12**;

FIG. **14** illustrates a top plan view of still another alternative form of the present invention;

FIG. **15** is a sectional view taken along line **15—15** of FIG. **14**;

FIG. **16** is a top plan view of still another form of the present invention; and

FIG. **17** is a sectional view taken along line **17—17** of FIG. **16**;

FIG. **18** is a partial longitudinal section of still, another embodiment of the present invention; and

FIG. **19** is a sectional view taken along line **19—19** of FIG. **18**.

DETAILED DESCRIPTION OF THE PRESENT INVENTION

While the present invention is susceptible of embodiment in multiple forms, there are shown in the drawings and will hereinafter be described various preferred embodiments of the present invention with the understanding the present disclosure is to be considered as setting forth exemplifica-

tions of the invention which are not intended to limit the invention to the specific embodiments illustrated and described.

Referring now to the drawings, wherein like reference numerals indicate like parts throughout the views, there is shown in FIGS. **1** through **3** an impact tool **10** constructed in accordance with the present invention. The tool illustrated in FIGS. **1** through **3** for purposes of illustration is in the form of a hammer having exposed striking heads. It should be appreciated, however, the teachings of the present invention are equally applicable to other forms of impact tools such as axes, picks and the like tools.

In the example of the invention shown in FIGS. **1** through **3**, and as is typical, hammer **10** has a generally T-shaped configuration and includes a head structure **12** with a handle structure **14** extending therefrom and in a generally perpendicular relationship therewith.

The head structure **12** includes first and second independent or separate heads or members **20** and **30** which, in the illustrated form of the invention, are generally axially aligned in a first direction relative to each other. The heads or members **20, 30** extend toward first and second sides, respectively, of the tool **10**. In one form of the invention, the heads or members **20, 30** of the head structure **12** are fabricated from a suitable metal or metal alloy. The head or member **20** of head structure **12** defines an exposed striking surface **22** while head or member **30** of head structure **12** defines an exposed striking surface **32**. As will be appreciated, the heads **20, 30** and the striking surfaces **22, 32** respectively, could be encased to limit marring of the surface struck or impacted with the tool without detracting or departing from the spirit and scope of the present invention. Moreover, the configurations of the heads or member **20, 30** of head structure **12** can be other than that shown without departing or detracting from the spirit and scope of the present invention.

The handle structure interconnects the heads **20, 30** of the head structure **12** to each other and extends in a second direction away from the head structure **12** to provide a generally T-shaped formation or configuration to the tool **10**. The handle structure **14** includes an elongated handle **40**, a lengthwise portion of which extends through and interconnects the heads or members **20, 30** of the head structure **12** to each other. The handle **40** of handle structure **14** is formed from a class of materials including: wood such as hickory, plastic, metal, nylon, fiberglass, elastomeric, or composite materials. In the illustrated form of the invention, the handle **40** of handle structure **14** is preferably of one-piece construction between opposite ends **42** and **44** thereof to reduce the opportunity of vibrations passing therethrough.

As shown in FIG. **2**, the head piece or member **20** of the head structure **12** includes a working portion **24** and an attachment portion **26**. Similarly, the head piece or member **30** of the head structure **12** includes a working portion **34** and an attachment portion **36**. Notably, a lengthwise portion of the handle **40** extends through and interconnects the attachment portions **26, 36** of the heads or members **20, 30** of the head structure **12**.

The head pieces or members **20, 30** of the head structure **12** are configured to interconnect relative to each other to prevent their inadvertent separation from each other and from the handle structure **14** during use of the impact tool. To prevent the head pieces or members **20, 30** from moving beyond a predetermined axial distance or becoming disassociated with the handle structure **14** during use the tool **10**, the attachment sections or portions **26, 36** are each configured to surround more than a 180' circumferential segment of the lengthwise portion of the handle **40** extending therethrough. In the illustrated form of the invention, shown in FIG. **4**, each head piece or member **20, 30** defines a bore **21, 31**, respectively, extending therethrough for accommodating endwise reception and holding of a lengthwise portion of the handle **40**.

As shown in FIGS. **2** and **3**, handle structure **14** furthermore preferably includes a wedge-like insert **16** is driven into the free upper end **42** of the handle **40** passing through the attachment portions **26, 36** of the heads or members **20, 30**, respectively, thereby facilitating securement of the head structure **12** to the handle structure **14**. Of course, adhesive or other forms of attachment devices can be used to secure the head structure **12** to the **40** handle structure **14** in addition to the use of a wedge-like member **16** without detracting or departing from the spirit and scope of the present invention.

The head pieces or members **20, 30** of the head structure **12** are furthermore configured to prevent their axial displacement along the length of the handle **30**. As mentioned, the attachment sections or portions **26, 36** of the head pieces **20, 30**, respectively, are each secured to a lengthwise portion of the handle structure **14** extending therethrough. Moreover, the attachment sections **26, 36** of the heads or members **20, 30** of the head structure **12** are vertically arranged relative to each other to prevent their inadvertent displacement along the axial length of the handle **40** during operation of the tool **10**.

As shown in FIGS. **2** and **4**, the attachment portion **26, 36** of each head piece or member **20, 30** is configured with an axially extending recess **23, 33** shaped to complement an axial projection **25, 35** defined on the heads or members **20, 30** of the head structure **12**. As will be appreciated, and as shown in FIG. **2**, when the head pieces or members **20, 30** of the head structure **12** are assembled relative to each other, the axial projection **25** on the head or member **20** is accommodated within the complementary shaped axially extending recess **33** defined on the head piece or member **30** of head structure **12**. Similarly, and after the head pieces or members **20, 30** of the head structure **12** are assembled relative to each other, the axial projection **35** on the head or member **30** is accommodated within the complementary shaped axially extending recess **23** defined on the head piece or member **20** of head structure **12**. Since the head pieces **20, 30** are each secured to a lengthwise portion of the handle structure **14** extending therethrough, the relationship of the projections **25, 35** coact with the recesses **23, 33** to prevent displacement of the head pieces or members **20, 30** relative to each other and along the length of the handle structure **14** even if the securement between the one of the head pieces or members **20, 30** fails.

According to one salient feature of the present invention, the head pieces or members **20, 30** of the head structure **12** are axially separated from each other by a predetermined axial distance. As shown in the drawings, the head pieces **20** **30** of the head structure **12** are separated from each other in an axial or first direction extending generally perpendicular to the axis of the handle **40** a distance ranging between about 0.010 inches and about 0.070 inches. The distance separating the heads or members **20, 30** of head structure **12** being substantially exaggerated in the drawings for purposes of explanation.

As shown in FIGS. **2** and **4**, the head pieces or members **20, 30** of head structure **12** are provided with complementary and confronting impact surfaces that are axially sepa-

rated from each other by the predetermined distance mentioned above. In the illustrated form of the invention, an impact surface **27** is provided within the recess **23** on the head piece or member **20** of head structure **12** in spaced and confronting relationship relative to an impact surface **38** on the axial projection **35** of head piece or member **30** of the head structure **12**. Similarly, an impact surface **37** is provided within the recess **33** on the head piece or member **30** of head structure **12** in spaced and confronting relationship relative to impact surface **28** on the axial projection **25** head piece or member **20** of the head structure **12**.

In this, as well as the other illustrated forms of the invention disclosed herein, only one set or pair of complementary confronting impact surfaces necessarily needs to be spaced apart the preferable range of about 0.010 inches to about 0.070 inches. Other confronting impact surfaces defined on the head pieces or members **20**, **30** of the head structure **12** can be spaced a further distance apart from each other without detracting or departing from the spirit and scope of the present invention. As will be appreciated, and as shown, more than one impact surface can be defined on the head pieces or member **20**, **30** of head structure **12** without detracting or departing from the spirit and scope of the present invention as long as the axial spacing between the confronting surfaces is the same.

Another salient feature which distinguishes the present invention from heretofore known tools relates to isolating the two-piece head structure **12** from the handle structure **14** to significantly reduce vibrations transmitted to and through the handle **40** to the user. As shown in FIGS. **1** through **3**, elastomeric material **50** is provided between the handle structure **14** and the head pieces or members **20**, **30** of the head structure **12** along the lengthwise portion of the handle **40** extending through the head structure **12**. Notably, the elastomeric material **50**, disposed between the head pieces **20**, **30** of the head structure **12** and the handle structure **14**, promotes axial movement of the unstruck head piece toward the head piece that is struck against a surface.

In the illustrated form of the invention, a sleeve **52** formed from an elastomeric material is disposed about and along the lengthwise portion of the handle **40** passing through the head structure **12**. The elastomeric sleeve **52** is secured to that lengthwise portion of the handle structure **14** passing through the head structure **12** and to each of the head pieces or members **20**, **30** of the head structure **12** as by adhesive or the like. As will be appreciated, and in addition to the wedge-like member **16** driven into the free end **42** of the handle **40**, the adhesiveness of the sleeve **52** to the heads or members **20**, **30** and to the handle portion **40** furthermore facilitates maintaining the head structure **12** in operable association with the handle structure **14**.

As will be appreciated by those skilled in the art, the elastomeric material can take a myriad of forms. In the preferred embodiment, an elastomeric composition having a Shore A durometer hardness ranging between about 40 and 95 appears to be best suited for this application.

Another embodiment of a tool embodying features of the present invention is schematically illustrated in FIGS. **5** and **6**. This alternative form of impact tool is designated generally by reference numeral **110**. The elements of this alternative form of impact tool that are identical to or functionally analogous to those components discussed above regarding impact tool **10** are designated by reference numerals identical to those used above with the exception that this embodiment uses reference numerals in the **100** series.

In this embodiment of the invention, the head structure **112** and handle structure **114** are substantially similar to that discussed above. As mentioned above, the head structure **112** includes a pair of axially separated striking heads **120**, **130**. Moreover, the handle structure **114** includes an elongated handle **140** having opposite ends **142**, **144**.

The head piece or member **130** of the head structure **112** defines a bore **131** extending therethrough and through which a lengthwise portion of the handle structure **114** extends. The head piece or member **120** of the head structure **112**, however, defines a counterbore **121** which accommodates a lengthwise portion of the handle **140** of handle structure **114**. In the embodiment of the invention schematically illustrated in FIG. **16**, the handle structure **114** furthermore preferably includes a wedge-like insert **116**. As shown, the head piece or member **120** of head completely therethrough. Notably, the counterbore **121** of head piece or member **120** can be structure **112** is provided with an aperture or opening **129** for permitting endwise passage of the wedge-like member therethrough and into the free end of the handle **140** thereby enhancing securement of the head structure **112** and handle structure **114** in operative combination relative to each other.

Notably, the counterbore **121** of the head piece or member **120** and the bore **131** of head piece or member **130** are each configured to accommodate elastomeric material **150** disposed, at least, on opposite sides of the handle structure **114**. As will be appreciated, and as discussed in detail above, the handle structure **114** and/or the elastomeric material **150** can be suitable secured to the head structure as through adhesive or the like.

Another embodiment of a tool embodying features of the present invention is schematically illustrated in FIG. **7**. This alternative form of impact tool is designated generally by reference numeral **210**. The elements of this alternative form of impact tool that are identical to or functionally analogous to those components discussed above regarding impact tool **10** are designated by reference numerals identical to those used above with the exception that this embodiment uses reference numerals in the **200** series.

In this embodiment of the invention, the head structure **212** is substantially similar to that discussed above. As mentioned above, the head structure **212** includes a pair of axially separated striking heads **220**, **230**. The head pieces or members **220**, **230** of the head structure **212** defines bores **221**, **231**, respectively, extending therethrough and through which a lengthwise portion of a handle structure **214** extends to hold the attachment portions **226**, **236** of the head pieces or members **220**, **230**, respectively, together in interconnected relationship relative to each other. Of course, with a simple change the bore **221** of head piece **220** could be configured with a counterbore like head piece **120** discussed above without detracting or departing from the spirit and scope of the present invention.

The handle structure **214** in this embodiment of the invention extends through and holds the head pieces **220**, **230** of the head structure **220** in axially separated relation relative to each other. In this embodiment, the handle structure **214** includes an elongated handle **240** with an enlarged head piece **241** toward that end that passes endwise through the attachment portions **226**, **236** of the head pieces or members **220**, **230**, respectively, of the head structure **212**. In this embodiment of the invention, at least the enlarged head piece **241** of handle structure **214** is formed from an elastomeric composition having a Shore A durometer hardness ranging between about 40 and 95.

The enlarged head piece **241** of handle **240** is sized to snugly fit within bores **221**, **231** defined in the head pieces

or members **220**, **230** of the head structure **212** and be secured thereto as with adhesive. The handle structure **214** can further include a wedge-like member (not shown) driven onto the free end thereof, or any other suitable affixation device or method. As discussed above, attachment portions **226**, **236** of the head pieces or members **220**, **230**, respectively, extend at least partially in surrounding circumferential relation relative to a lengthwise portion of the enlarged head piece **242** thereby preventing complete separation of the head pieces or members **220**, **230** from the handle **240**. Although the attachment portions **226**, **236** of the head pieces or members **220**, **230**, respectively, of the head structure **212** appear different than the attachment portions **26**, **36** discussed above regarding head pieces **20**, **30**, they are intended to serve the identical function to that discussed above and are maintained in normally separated relation relative to each other.

Another embodiment of a tool embodying features of the present invention is schematically illustrated in FIGS. **8** and **9**. This alternative form of impact tool is designated generally by reference numeral **310**. The elements of this alternative form of impact tool that are identical to or functionally analogous to those components discussed above regarding impact tool **10** are designated by reference numerals identical to those used above with the exception that this embodiment uses reference numerals in the **300** series.

In this embodiment of the invention, the tool **310** is configured as a carpentry hammer. The head structure **312** of the hammer **310** includes first and second pieces or members **320**, **330**, respectively, joined to each other by an elongated handle structure **314** extending generally normal to and away from the head structure **312**. The handle structure **314** includes an elongated handle **340**, a lengthwise portion of which extends through and interconnects the heads or members **320**, **330** of the head structure **312** to each other. The handle **340** is preferably formed from a class of materials including: wood such as hickory, plastic, metal, nylon, fiberglass, elastomeric composite materials. The handle **340** is preferably of one-piece construction between opposite ends **342** and **344** thereof. The handle structure **314** furthermore preferably includes a wedge-like structure or insert **316** forced into the upper free end **342** of the one-piece handle **340** of handle structure **314**. The insert **316** of handle structure **314** circumferentially expands that end of handle structure **314** passing, at least partially, through the head structure **312** thereby enhancing the securement of the handle structure **314** to the head structure **312**.

As shown, the first piece **320** of the head structure **212** is configured as a striking head with a striking surface **322**. The other piece or member **330** of the head structure **312** has a claw-like configuration including a pair of laterally spaced tines or members **339** and **339'** extending away from handle **340** of the handle structure **314**.

To promote axial movement of the heads or members **320**, **330** of the head structure **312**, elastomeric material **350** is inserted between opposed sides of the handle **340** and attachment portions **326**, **336** of the heads or members **320**, **330**, respectively, of the head structure **312**. As will be appreciated, the elastomeric material furthermore isolates the head structure **312** from the handle structure **314** thereby inhibiting vibrations from being transferred along the length of the handle **314** to the user. In the illustrated form of the invention, the elastomeric material **350** is in the form of strips of elastomeric material **352** arranged between opposed lengthwise sides of the handle **340** and the heads **320**, **330** of the head structure **312**.

In this embodiment of the invention, the attachment portions **326**, **336** of the head pieces or members **320** have a clevis-like configuration to enhance distribution of the forces acting on the heads or members **320**, **330** of the head structure **312**. In the embodiment illustrated in FIG. **9**, the attachment portion **326** of the head piece or member **320** of head structure **312** includes an axially elongated vertically spaced projections **360**. Each axially elongated projection **360** on head piece or member **320** defines an opening or aperture **362** circumferentially extending, at least partially, about a lengthwise section of the handle **340** to hold the striking head **320** to the handle structure **314**. In the illustrated embodiment, the opening **362** defined by the attachment section **326** is sized to fit snugly about the elastomeric material **352** fitted about the handle **340**.

The attachment portion **336** of the head piece or claw-like member **330** of the head structure is configured with a pair of elongated axially extending, vertically spaced projections **370** which, in the illustrated embodiment, are embraced by the projection **360** of head piece or member **320**. The projections **370** of the head piece or claw-like member **330** define a pair of vertically aligned openings or apertures **374** which circumferentially extend, at least partially, about a lengthwise portion of the handle **340** extending endwise therethrough. In the illustrated embodiment, the openings **374** defined by the attachment section **336** of the head piece or claw-like member **330** are sized to fit snugly about the elastomeric material **352** fitted about the handle **353**.

As shown in FIG. **9**, the striking head **320** of head structure **312** is formed with axially elongated recesses **323** defining vertically aligned impact surfaces **327** for accommodating axial displacement of the attachment portion **336** of the claw-like member **330** there toward. Similarly, the claw-like member or head **330** of the head structure **312** is formed with axially elongated recesses **333** defining impact surfaces **337**.

As shown, each of the axially elongated projections **360** forming part of the attachment portion **326** of the striking head **320** is formed with an impact surface **328** at the distal end thereof Moreover, the axially elongated projections **370** forming part of the attachment portion **336** of the claw-like member **330** of head structure **312** each define vertically aligned impact surfaces **338** at the distal ends of the projections **370**, **372**, respectively.

As shown in FIG. **9**, when the heads **320**, **330** are assembled relative to each other, the impact surfaces **328** on the head piece or member **320** of the head structure **320** are maintained in a predetermined spaced and confronting relationship relative to the impact surfaces **337** formed on the claw-like member or head **330**. Moreover, when the heads **320**, **330** are assembled relative to each other, the impact surfaces **338** at the distal ends of the projections **370** extending from the claw-like member **330** will be maintained in a predetermined spaced and confronting relationship relative to the impact surfaces **327** formed on the striking head **320**.

Still another embodiment of a tool embodying features of the present invention is illustrated in FIGS. **10** and **11**. This alternative form of impact tool is designated generally by reference numeral **410**. The elements of this alternative form of impact tool that are identical to or functionally analogous to those components discussed above regarding impact tool **10** are designated by reference numerals identical to those used above with the exception that this embodiment uses reference numerals in the **400** series.

Tool **410** is again configured as a carpentry hammer. The head structure **412** of the hammer **410** includes first and second pieces or members **420**, **430**, respectively. The tool

or hammer **410** further includes a handle structure **414** extending from the head structure **412** at a generally perpendicular relationship thereby providing a generally T-shaped configuration to the tool **410**.

As shown, the first piece **420** of the head structure **412** is configured as a striking head with a striking surface **422**. The other member **430** of the head structure **412** is configured with a claw-like design including a pair of laterally spaced tines or members **439** and **439'**.

In this embodiment of the invention, the striking head **420** is preferably of one piece construction and includes a working portion **424** and an attachment portion **426**. The attachment portion **426** of the striking head **420** is specifically configured to be captively received by the claw-like member **430** of the head structure so as to prevent its axial separation therefrom and yet allow a degree of axial movement along a predetermined path relative to the claw-like member or head piece **430**. In the illustrated embodiment, the attachment portion **426** of the striking head **420** is configured with an enlarged end portion **460** to retain the head **420** in captive but axially slidable relationship relative to head piece **430**.

The claw-like member **430** of the head structure **412** has a laminated configuration including first and second halves or pieces **470**, **472** which are the mirror image of each other and, when assembled, provide the entire shape to the claw-like member **430** of the head structure **412**. Each piece **470**, **472** of the claw-like member **430** defines a open sided cavity **473** having a shape corresponding to one half of the attachment portion **426** of the striking head **420**. Moreover, each piece **470**, **472** of the claw-like member **430** defines an open sided channel **474** conforming to one-half of the cross-sectional configuration of the lengthwise portion of the one-piece handle **440** extending endwise therethrough.

In the illustrated form of the invention, and as made possible by the laminated structure of the head piece **430**, the attachment portion **426** of the head piece **420** is captively received within a recess formed by the abutting cavities **473** defined by the pieces **470**, **472** of the head piece **430** of the head structure **412** while the handle **440** forming handle structure **414** extends only through the head piece or claw member **430** of the head structure **412**. The laminations **470**, **472** forming the claw-like member **430** of the head structure **412** are fixedly held to each other as by a series or plurality of rivets **480** or other suitable securement devices.

As shown, the handle **440** has a changing cross-sectional configuration along that lengthwise portion extending through the claw-like member **430** of the head structure. The changing cross-sectional configuration of the handle **440** is specifically configured to secure the claw-like member **430** along the length of the handle structure **414**. In the illustrated embodiment of the invention, a generally centralized lengthwise section of the handle **440** has a reduced outer configuration from those lengthwise sections of the handle **440** arranged adjacent upper and lower sides of the claw-like member **430**. Accordingly, the handle **440** is prevented from axially moving along its length relative to the claw-like member. Of course, configurations other than that exemplified may equally suffice without detracting or departing from the scope of the present invention. Notably, however, the laminated or lengthwise split configuration of the member **430** allows such a design to capture the handle structure **414** relative to the head structure **412**. Moreover, in the illustrated form of the invention, the handle **440** has a cross-sectional configuration which inhibits the handle **440** from rotating or turning relative to the head piece **430**. Furthermore, and to inhibit vibrations from transferring along the length of the handle structure, the handle **440** is preferably configured as a one-piece member.

To further reduce vibrations from being transmitted along the length of the handle structure, elastomeric material **450** is inserted between the lengthwise portion of the handle **440** and the that portion of head piece **430** arranged in surrounding relationship thereto. As will be appreciated, the elastomeric material **450** only needs to be positioned on opposite sides of the handle **440** to promote axial movements of the head pieces **420**, **430** toward each other. In the illustrated form of the invention, however, a sleeve **452** of elastomeric material is positioned along and about the lengthwise portion of the handle **440** extending through the head piece **430** of the head structure **412**. The elastomeric material has a hardness ranging between about a Shore A durometer hardness and about a 95 Shore A durometer hardness.

As shown in FIGS. **10** and **11**, the attachment portion **426** of the head piece or striking head **420** of the head structure **412** is configured with an elongated shank-like projection axially extending from the striking head **420** with an impact surface **428** at a distal end thereof Moreover, the claw-like member **430** is configured with a recess **433** shaped to accommodate the shank-like projection **426** on the head piece or member **420**. Notably, an impact surface **427** is defined by the recess **473**. As will be appreciated, when the heads **420**, **430** are assembled relative to each other, the impact surface **428** on the striking head **420** and the impact surface **437** on the claw-like member **430** are in confronting but axially spaced relation relative to each other. The axial spacing having a predetermined distance therebetween. In the illustrated embodiment, an elastomeric material **481** is positioned between the impact surface **428** on the head or member **420** and the impact surface **437** on the claw-like member **430** to act as a spring for maintaining the axially spaced relationship between the confronting impact surfaces defined by the head or members **420**, **430** of the head structure **412**.

FIGS. **12** and **13** illustrate an alternative embodiment of the invention substantially similar to that illustrated in FIGS. **10** and **11**. This embodiment of the invention includes substantially the same structure as discussed above regarding tool **410** with the exception of the manner by which the striking head **420** is secured to the claw-like member **430**. In this embodiment of the invention, the attachment portion **426** on the striking head **420** is configured as an axially elongated shank-like projection axially extending away from the striking head **420** and is slidably received for axial movement within a cavity **433** defined by the head piece or claw-like member **430**. That is, and with this embodiment of the hammer **410**, the axially extended projection **426** is arranged for endwise or axial sliding movement within the recess **433** in the claw-like member **430** defined by the two abutting laminations **470**, **472**.

As mentioned above, in this embodiment of the invention, a series of rivets or other suitable fasteners **480** serve to fixedly hold the laminations **470**, **472** to each other. In the illustrated form of the invention, the rivets or fasteners **480** are shown as extending through the laminations **470**, **472** and holding them in fixed relation relative to each other it will be appreciated by those skilled in the art, however, the fasteners do not necessary need to extend completely through both laminations **470**, **472**. Other alternative means of securing the laminations **470**, **472** to each other would equally suffice without detracting or departing from the novel spirit and scope of the present invention. In the illustrated form of the invention shown in FIGS. **12** and **13**,

at least one elongated fastener **480** axially extends through the shank-like axial projection on head piece **420**. The axially elongated projection **426** is provided with a through-bore **482** having a diameter greater than the diameter of the rivet or fastener **480** used to hold the laminations **470**, **472** in assembled relation relative to each other. As shown in the drawings, a bearing sleeve of elastomeric material **484** fills the void around the rivet or fastener **480** and the internal diameter of the bore **482**. The elastomeric material will have generally the same characteristics as mentioned above and will serve to maintain the impact surfaces **437** and **428** on the head members or pieces **420** and **430** of the head structure in predetermined axially spaced relation relative to each other while also allowing for the impact surfaces to collide with each other when the striking head **420** is stricken against a surface or object.

A further embodiment of a tool embodying features of the present invention are schematically illustrated in FIGS. **14** and **15**. This alternative form of impact tool is designated generally by reference numeral **510**. The elements of this alternative form of impact tool that are identical to or functionally analogous to those components discussed above regarding impact tool **10** are designated by reference numerals identical to those used above with the exception that this embodiment uses reference numerals in the **500** series.

Tool **510** is similar in configuration to the tool **10** discussed above and shown in FIGS. **1** through **3**. In this embodiment of the invention, the tool **510** includes a head structure **512** including first and second pieces or members **520** and **530**, respectively, which are axially aligned in a first direction. The tool or hammer **510** further includes a handle structure **514** extending from the head structure **512** in a second direction and generally perpendicular to the head structure **512** thereby providing a generally T-shaped configuration to the tool **510**.

The head pieces or members **520** and **530** of the head structure **512** are each formed from a series of laminations **529** and **539**, respectively, fixedly held to each other by a series of suitable rivets or fasteners **580**. Each plate or lamination **529** forming the head piece or member **520** is configured with a cutout **522** which, after the plates **529** are assembled relative to each other, define a recess **523** including at least one impact surface **527**. Moreover, each lamination or plate **529** of the head member or piece **520** has an extension **526** having an impact surface **528** at a distal end thereof. Each plate or lamination **539** forming the head piece or member **520** is configured with a cutout **532** which, after the plates **539** are assembled relative to each other, define a recess **533** including at least one impact surface **537**. Moreover, each lamination or plate **539** of the head member or piece **530** has an extension **536** having an impact surface **538** at a distal end thereof. Notably, when the laminated head pieces **520**, **530** are assembled relative to each other, the impact surfaces **527**, **538** and **537**, **528**, respectively, are arranged in confronting but predetermined spaced relationship relative to each other in substantially the same manner as discussed above.

In this embodiment of the invention, one each of the laminated plates **529**, **539** forming the laminated head pieces **520**, **530** of the head structure **512** is formed like the other except that one each of the plated **529**, **539** is sufficiently sized to permit a bore **521**, **531** to be provided therein for allowing a lengthwise portion of the handle structure **514** to extend endwise therethrough. As described above, the handle structure **514** furthermore preferably includes a suitably shaped member, such as a wedge-like member **516**, which is driven into or operative extends from the free end **542** of the handle **540** of handle structure **514** to facilitate securement of the head structure **512** to the handle structure **514**.

Such that either end of the head structure **512** can be used for striking purposes, a cap structure **570** fits about the ends of the laminations **529**, **539** of the heads or members **520**, **530** of the head structure **512**. As will be appreciated, the cap structure **570** defines a striking surface **525**, **535** for each head or member **520**, **530** of the head structure **512**. In the illustrated form of the invention, each cap structure **570** defines a peripheral wall or skirt **527** arranged in capturing and surrounding relation relative to the laminations **529**, **539** of the head or members **520**, **530** thereby inhibiting the laminations **529**, **539** from "separating" relative to each other as the tool **510** is used to strike a surface. The cap structure **570** is secured as through any suitable means to the ends of the laminations **529**, **539** forming the heads or members **520**, **530** of the head structure **512**. It is also within the scope of the present invention to configure the head structure of the impact tool **510** such that alternating laminations can be formed from an elastomeric material.

A still further embodiment of a tool embodying features of the present invention are schematically illustrated in FIGS. **16** and **17**. This alternative form of impact tool is designated generally by reference numeral **610**. The elements of this alternative form of impact tool that are identical to or functionally analogous to those components discussed above regarding impact tool **10** are designated by reference numerals identical to those used above with the exception that this embodiment uses reference numerals in the **500** series.

The tool **610** is similar in configuration to the laminated tool **510** discussed above and shown in FIGS. **14** and **15**. In this embodiment of the invention, the tool **610** includes a head structure **612** including first and second pieces or members **620** and **630**, respectively, which are axially aligned in a first direction. The tool or hammer **610** further includes a handle structure **614** extending from the head structure **612** in a second direction and generally perpendicular to the head structure **612** thereby providing a generally T-shaped configuration to the tool **610**.

The head pieces or members **620** and **630** of the head structure **612** are each formed from laminations **621** and **631**, respectively, fixedly held to each other by a series of suitable rivets or fasteners **680**. To reduce vibration transmission through the handle structure **614** and to allow the head pieces **620**, **630** of the head structure **612** to collide relative to each other, at least one other lamination **625** formed from an elastomeric material is sandwiched or inserted between the laminations **621** and **631** forming the head pieces or member **620**, **630** and is secured to each by the fasteners **680**.

The laminations **621**, **631** each define an impact surface **627**, **638** and **628**, **637**, respectively, arranged thereon. The impact surfaces **627**, **638** and **637**, **628**, respectively, on the laminations **621**, **631** forming the head pieces or members **620**, **630** of head structure **612** are arranged in confronting axially spaced relation relative to each other.

As shown, the handle structure **614** includes a one-piece handle **640** have a changing cross-sectional configuration along that lengthwise portion extending endwise through the elastomeric lamination **625** of the head structure **612**. The changing cross-sectional configuration of the handle **640** is specifically configured to secure the elastomeric lamination **625** along the length of the handle structure **614**. As shown,

the lengthwise section of the handle **640** arranged in operative association with the head structure **612** preferably has an hourglass configuration. Accordingly, the handle **640** is prevented from axially moving along its length relative to the laminations **625** and, thus, relative to head structure **612**. Of course, configurations other than that exemplified may equally suffice without detracting or departing from the scope of the present invention. Notably, however, the laminated or lengthwise split configuration of the head structure **612** allows such a design to capture the handle structure **614** relative to the head structure **612**.

FIGS. **18** and **19** schematically illustrate still another embodiment of an impact tool embodying salient features of the present invention. This alternative form of impact tool is designated generally by reference numeral **710**. The elements of this alternative form of impact tool that are identical to or functionally analogous to those components discussed above regarding impact tool **10** are designated by reference numerals identical to those used above with the exception that this embodiment uses reference numerals in the **700** series.

Tool **710** is again configured as a carpentry hammer. The hammer **710** includes a head structure **712** and an elongated handle structure **714** extending generally normal to the head structure **712**. One of the salient features involving this embodiment of the invention concerns the composite structure of the hammer **710**. That is, in this embodiment of the invention, a skin or sock **702** extends about and along at least that lengthwise portion of the handle structure **714** extending into operative cooperation with the head structure.

In a preferred form of the invention, the skin **702** is fabricated from an arimid fiber material such as KEVLAR® marketed and sold by the DuPont Corporation. The arimid fiber material used in combination with the present invention has a unique combination of high strength, high modulus and toughness. The arimid fiber material or skin **702** is encapsulated or impregnated into an epoxy such as that sold and marketed by Ad-Tech as CER-**112**. This aspect of the present invention takes advantage of the natural tendency of the free ends of woven or braided fiber to fray and expand. As will be appreciated, and after the epoxy solidifies and hardens about the woven fabric or skin **702**, the epoxy impregnated into the fiber sleeve maintains the frayed ends of the sleeve **702** in a radially expanded configuration, as schematically illustrated in FIG. **18**, and thereby enhances the interface between the head structure **712** and the handle structure **714** while furthermore preventing the handle structure **714** from pulling out or separating from the head structure **712**.

In one form, a cover **704** is disposed along and about a lengthwise portion of the handle structure **714** disposed beneath and in combination with the head structure **712**. The purpose of the cover **704** is to extend about a lengthwise portion of the epoxied and impregnated fiber material extending beyond the head structure **712** of the tool **710**. To maintain the distinctive character of the tool **710**, however, at least a lengthwise portion of the cover **704** is transparent or otherwise visually permeable to permit visual access to the material skin **702** while inhibiting inadvertent unwrapping or unraveling of the impregnated fiber skin **702**.

In that form illustrated in FIGS. **18** and **19**, head structure **712** includes first and second pieces or members **720** and **730**, respectively. The members or pieces **720**, **730** of head structure **712** are joined by the elongated handle structure **714** extending, at least partially, therethrough.

As shown, the first member or piece **720** of head structure **712** is configured as a striking head with a striling surface **722**. In the illustrated embodiment of the invention, the other piece or member **730** of the head structure **712** has a claw-like configuration including a pair of laterally spaced tines or members **739** and **739'**.

In the illustrated form of the invention, and as made possible by the two-piece split head design, the head piece **720** includes an attachment portion **726** projecting away from and generally normal to the striking surface **722**. The head piece **730** likewise includes an attachment portion **736** defining an elongated opening **773** for endwise receiving the attachment portion **726** of head piece or member **720**. Notably, the opening **773** allows for radial expansion of the frayed free ends of the sock **702** in the manner described above. In the illustrated embodiment, the attachment portion **726** of head piece or member **720** has a generally semi-circular configuration extending axially away from the distal end of member **720** arranged opposite from the striking surface **722** to provide further space for expansion of the free ends of the braided sock **702**. Moreover, the distal end of the attachment portion **726** of head piece or member **720** defines an impact surface **728** arranged in confronting but spaced relationship to an impact surface **738** defined by an end wall of the elongated recess or opening **773** defined by head member or piece **730**. The confronting impact surfaces **728**, **738** on the heads **720**, **730**, respectively, are spaced from reach other in the same relationship described above to advantageously yield a dead-blow characteristic to the hammer **710**.

As shown in FIGS. **18** and **19**, the attachment portion **726** of head piece or member **720** further defines an open ended recess or opening **727** extending therethrough. Similarly, the attachment portion **736** of the head piece **730** defines a throughbore or opening **737** for accommodating the handle structure **714** and which opens to an upper surface of the head piece or member **730** of head structure **712**. Notably, when the split head pieces or members **720** and **730** of head structure **712** are arranged in operative relationship relative to each other, as shown in FIGS. **18** and **19**, the openings or recesses **727** and **737** defined by the attachment portions **726** and **736** of the head members **720** and **730**, respectively, of head structure **712** are in general registry with one another.

A lengthwise portion of handle structure **714** of tool **710** extends through the head pieces or members **620**, **730** of head structure **712** thereby joining them in operative combination relative to each other. In the embodiment of the invention schematically illustrated in FIGS. **187** and **19**, handle structure **714** includes an elongated handle **740**, a member **716** extending endwise from that end of the handle **740** extending into the head structure **712**, and an elastomeric link **750** which operatively acts as a lengthwise extension of that portion of the handle **740** inserted into the head structure **712**.

The handle **740** of the handle structure **714** is preferably formed from a class of materials including: woods, such as hickory; plastic; metal; nylon; fiberglass; or other suitable rigid material. The handle **740** has opposed ends **742** and **744**. As shown in FIGS. **18** and **19**, the end **742** of handle **740** is configured for insertion within the head structure **712** of the tool. In this regard, and to enhance its insertion within the head structure **712**, the end **742** of handle **740** preferably has an inwardly tapered configuration.

In the illustrated form of the invention, member **716** of the handle structure **714** has a generally wedge-like configuration but any suitable design would equally suffice without detracting or departing from the spirit and scope of the present invention. For example, a screw threaded into the

free end **742** of the handle **740** would equally apply. Notably, member **716** axially extends from and is secured to the free end **742** of handle **740** of handle structure **714**. Moreover, the member **716** projects endwise through the openings **727** and **737** defined by the attachment portions **726** and **736**, respectively, of the heads or pieces **720**, **730** forming the head structure **712**.

To further reduce vibrations from being transmitted along the handle structure **714** during use of the tool **710**, handle structure **714** further includes the elastomeric link **750** for resiliently joining the head pieces or member's **720**, **730** of the head structure **712** to each other and to handle structure **714**. The elastomeric link **750** has a durometer hardness ranging between about 40 Shore A durometer hardness and about a 95 Shore A durometer hardness. As will be appreciated from an understanding of the present invention, the elastomeric link **750** acts as a spring for returning the nonstruck head of the head structure **712** to a normal or operational position after moving toward and impacting with the struck head or member of the head structure **712**. Accordingly, any suitable material which, during use of the tool **710**, will initially compress and subsequently return the unstruck head piece or member to an operational position relative to the struck head after the struck head has impacted with a surface will suffice.

Assembly of the impact tool **710** illustrated in FIGS. **18** and **19** preferably involves the following steps and processes. The free end **742** of handle **740**, with the arimid sock to sleeve **702** arranged thereabout, is inserted into the head piece **730** of head structure **712**. The attachment portion **726** of head piece **720** is then inserted into the opening **773** and into operative relationship with the head member **730**. The epoxy or adhesive is the introduced through the openings **727** and **737** of the head pieces **720**, **730**, respectively, to impregnate and wet the arimid fiber sleeve **702** thereby enhancing the securement between the head structure **712** and handle structure **714** interface. Thereafter, member **716** of handle structure **714** is inserted into operative association with the free end **742** of handle **740** thereby causing outward radial expansion of the free end **742** of handle **740** and thereby further enhancing the securement between the head structure **712** and handle structure **714** interface. Next, an elastomer, such as polyurethane, is inserted or injected into the openings **727** and **737** of the head pieces **720** and **730**, respectively, to completely fill the voids and surround that portion of member **716** extending axially from the handle **740**. As will be appreciated, and when solidified, the polyurethane acts as the elastomeric link **750** joining the head pieces or members **720**, **730** of head structure to each other and to handle **740**.

The cover **704** can be arranged about the handle **740** of handle structure **714** prior to insertion of the handle **740** into operative association with the head structure **712**. After the head structure **712** and handle structure **714** are fixed to each other, the cover **704** is slidably moved into the position illustrated in FIGS. **18** and **19** relative to the head structure **712**. Alternatively, and in a manner well known in the art, the cover **704** can be molded about the handle **740** of handle structure **714** after the head structure **712** and handle structure **714** are arranged in operative association relative to each other.

The split head impact tool described above has several advantages over heretofore known impact tools. Unlike other impact tools, the heads or members of the head structure of the present invention are formed separate from each other. As will be appreciated, separately forming the heads or members of the head structure facilitates interchangability and significantly simplifies the manufacturing process. Rather than having to forge an entire head assembly for a impact tool, various manufacturing methods or processes can be used to fabricate the heads or member so the head structure of then present invention in the most economical fashion possible. For example, the separate heads or members of the head structure may be individually forged, cast, or they can be formed as laminated formations depending on which manufacturing process best serves the manufacturers needs.

Unlike heretofore known impact tools, the separate heads of the head structure of the present invention are interconnected to each other by the handle structure of the tool extending therethrough. In a preferred form of the present invention, each head or member of the head structure includes a working end or portion and an attachment portion. The attachments portions or ends of the heads or members of the head structure are interconnected to each other by the handle extending therethrough in a manner heretofore unknown.

The split head design of the present invention advantageously offers a unique "dead blow" characteristic during use of the impact tool. This dead blow characteristic is enhanced when elastomeric material is provided between the heads and opposite sides of the handle structure. The elastomeric material between the heads and the handle structure serves to maintain impact surfaces defined by the heads of the head structure in a predetermined spaced relationship relative to each other. The predetermined spacing between the impact surfaces on the heads or members of the head structure ranges between about 0.010 inches and about 0.070 inches. The spacing between the heads of the head structure is dependent upon a number of factors including: mass distribution or the head configurations; the hardness of the elastomeric material between the heads and the handle structure; the time of the collision between the impact surfaces; the length of time the striking head of the head structure remains in contact with the struck surface; and, whether the struck surface is stationary or movable. These are a few of the considerations for setting the spacing between the heads of the head structure.

The separated head design offered by the present invention allows the unstruck head of the head structure to act as a lagging mass that suppresses the rebound of the struck head. That is, the split heads of the head structure of the present invention are permitted to axially move along a predetermined path relative to each other such that when one head of the head structure is impacted on a surface of an object, the other head of the head structure moves toward and collides with the struck head thereby providing a secondary blow keeping the struck head from rebounding and, thus, deadening the blow of the hammer or impact tool. Moreover, the elastomeric material between the head structure and the handle structure serves to isolate the handle from the heads or members of the head structure, thus, significantly reducing the vibrations transferred along the handle to the user.

The alternative laminated structure for the heads of the head structure furthermore allows one head of the head structure to be captured by the other head of the head structure to further simplify the present invention. End caps define a striking surface for the head structure of the tool and inhibits "splitting" of the laminations during use of the tool.

As will be appreciated by those skilled in the art, the composite structure of such an impact tool design offers several advantages regardless of whether the head structure

embodies a split head design or is of unitary construction. First, using the arimid fiber material in combination with an epoxy offers increased strength between the head structure and handle structure interface. Second, such a composite structure isolates the head structure **712** from the handle structure **714**. Moreover, and because the skin **702** and epoxy add layers about that portion of the handle structure **714** passing into operative combination with the head structure **712** of the tool **710**, a more complex and complicated path needs to be traversed by the vibrations when the head structure **712** is struck against a surface. As will be appreciated, the more complicated path for vibrations to travel between the struck head and the handle advantageously yields vibration dampening characteristics during use of the tool **710**. Moreover, should a portion of the material skin or sock **702** extend beyond the head structure **712** and along a portion of the handle structure **714**, its appearance will undoubtedly add distinctiveness to the hammer design.

From the foregoing it will be observed that numerous modifications and variations can be effected without departing or,detracting from the true spirit and scope of the novel concept of the present invention. It will be appreciated that the present disclosure is intended to set forth exemplifications of the invention which are not intended to limit the invention to the specific embodiments illustrated. The disclosure is intended to cover by the appended claims all such modifications as fall within the spirit and scope of the claims.

What is claimed is:

1. A hammer, comprising:

a head assembly including first and second members, each member of said head assembly including a working portion and an integral attachment portion, and wherein the attachment portions of said members extend to opposite sides of a longitudinal axis defined by a handle structure; and

with said handle structure extending generally perpendicular to and through the attachment portions of said first and second members thereby operably interconnecting said first and second members of said head assembly to each other; and

an elastomer arranged in operable association with said handle structure and the attachment portions of the first and second members of said head assembly such that confronting and spaced impact surfaces defined on said first and second members of said head assembly are maintained in spaced relation relative to each other by a predetermined distance measuring between about 0.010 inches and about 0.070 inches.

2. A hammer, comprising:

a head assembly including first and second members, each member of said head assembly including a working portion and an attachment portion, with the attachment portion of each member extending to opposite lateral sides of an elongated axis defined by a handle structure;

wherein said handle structure passes through and is secured to the attachment portions of said first and second members of said head assembly thereby limiting movement of the first and second members of said head assembly relative to the longitudinal axis of said handle structure, with said handle structure including an elongated handle extending generally perpendicular from said head assembly; and

an elastomeric member arranged in operable association with the handle structure and said attachment portions of said first and second members.

3. The hammer according to claim **2** wherein said members of said head assembly are metal.

4. The hammer according to claim **2** wherein at least one of said members includes an exposed metal striking surface.

5. The hammer according to claim **2** wherein one of said members is configured as a striking head while the other member is configured as a claw.

6. The hammer according to claim **2** wherein said elastomeric member is formed from a urethane material having a durometer hardness ranging between about a 40 and about a 95 Shore A hardness.

7. An impact tool, comprising

a head assembly including first and second members, each member of said head assembly including a working portion and an attachment portion, and wherein each member of said head assembly further includes an impact surface arranged in axially spaced but confronting relation to an impact surface on the other member;

handle structure defining an elongated axis, with said handle structure passing through and secured to the attachment portions of the first and second members extending to opposite sides of said axis thereby interconnecting said first and second members to each other; and

elastomeric material disposed in operable association with said first and second members of said head assembly for maintaining said impact surfaces in predetermined spaced relation relative to each other, said elastomeric material acting as a dampener such that when one member of said head assembly is struck against a surface the unstruck member moves toward the struck member to provide a force that inhibits the struck member from bouncing from the surface and such that rebound of the impact tool is significantly reduced.

8. The impact tool according to claim **7** wherein at least one of the members of said head assembly has an exposed metal striking surface.

9. The impact tool according to claim **7** wherein one of the members of said head assembly is configured as a striking head while the other member of said head assembly is formed as a claw.

10. The impact tool according to claim **7** wherein the attachment portion of each member of the head assembly is arranged in surrounding relation relative to a lengthwise portion of said handle structure.

11. The impact tool according to claim **7** wherein the axial spacing between the confronting surfaces of the members of said head assembly measures approximately 0.010 inches to about 0.070 inches.

12. The impact tool according to claim **7** wherein both members of said head assembly are metal, and wherein said elastomeric member has a durometer hardness ranging between about 60 and about 95 Shore A hardness.

13. The impact tool according to claim **7** wherein said handle is formed from a class of materials including: wood, plastic, metal, nylon, fiberglass, or elastomers.

14. A generally T-shaped hammer, comprising:

a head assembly including first and second heads, with said first head extending in a first direction and defining a striking surface thereon, said first head including an attachment portion extending away from said striking surface and to one side of an elongated axis, and with said second head extending in a second direction opposed to said first direction, said second head including an attachment portion extending to an opposite side of said elongated axis;

handle structure extending generally normal to said first and second directions, said handle structure including

an elongated handle whose longitudinal centerline defines said elongated axis, with a lengthwise section of said handle structure extending into operative association with the first and second heads and said head assembly thereby maintaining said heads in operable association relative to each other;

elastomer material arranged in operative association with said first and second heads for maintaining confronting impact surfaces defined by said heads in a predetermined spaced relationship relative to each other; and

a woven fiber material disposed about and epoxied to a lengthwise section of said handle structure extending into operative association with said head assembly to enhance the interface therebetween while adding strength to the hammer.

15. The hammer according to claim **14** wherein said woven fiber comprises an arimid fiber.

16. A shock absorbing claw hammer, comprising:

a handle defining an elongated axis; and

a head structure arranged in combination with and disposed at one end of said handle, said head structure including a striking head portion and a claw portion extending opposite from said striking head portion and defining a slit therebetween which opens to an exterior of said head structure, and wherein the striking head portion and the claw portion define confronting impact surfaces which are spaced a predetermined distance apart from each other, and wherein the head structure and handle combination is configured such that the impact surfaces are disposed to one side of the elongated axis with the spacing between said confronting impact surfaces collapsing upon a hammer strike thereby substantially eliminating vibrations in the handle resulting from the hammer strike.

17. The claw hammer according to claim **16** wherein said handle comprises part of a handle structure, and wherein said handle structure and said head structure comprise individual pieces.

18. The claw hammer according to claim **16** wherein said striking head portion and said claw portion comprise individual pieces.

19. The claw hammer according to claim **17** wherein said striking head portion and said claw portion of said head structure each include attachment portions, and wherein at least a lengthwise portion of said handle structure extends endwise through the attachment portions of said head portion and said claw portion.

20. The claw hammer according to claim **16** wherein the predetermined spacing maintained between the confronting impact surfaces of said striking head portion and said claw portion of said hammer ranges between about 0.010 inches and about 0.70 inches.

21. A shock absorbing claw hammer, comprising:

an elongated handle defining an elongated axis and having opposed sides; and

a head structure arranged in combination with one end of said handle, said head structure including a striking head portion and a claw portion extending opposite from said striking head portion, and wherein the striking head portion and the claw portion define confronting impact surfaces, and wherein the head structure and handle combination is configured such that the impact surfaces are outwardly disposed to one side of the elongated axis and outwardly from opposed sides of said handle, and with a predetermined spaced relationship between said impact surfaces being maintained by an elastomer disposed within the head structure and which allows the spacing between the confronting impact surfaces to collapse other upon a hammer strike thereby substantially eliminating vibrations in the handle resulting from the hammer strike.

22. The claw hammer according to claim **21** wherein said handle comprises part of a handle structure, and wherein said handle structure and said head structure comprise individual pieces.

23. The claw hammer according to claim **22** wherein said striking head portion and said claw portion of said head structure each include attachment portions, and wherein at least a lengthwise portion of said handle extends endwise through the attachment portions of said head portion and said claw portion.

24. The claw hammer according to claim **21** wherein said striking head portion and said claw portion comprise individual pieces.

25. The claw hammer according to claim **21** wherein the predetermined spacing maintained between the confronting impact surfaces of said striking head portion and said claw portion of said hammer ranges between about 0.010 inches and about 0.70 inches.

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